We again wish to comment on the valuable work done by the Wages-Hour Committee of the National Association. Our Washington correspondent, Roland C. Davies, is giving us the latest up-to-the-minute progress on the amendment the Committee worked to have introduced to the Congress and this issue was held up in delivery to bring you the result of the next step scheduled for May 15. As carried in our April issue, the proposed amendment exempts exchanges having 500 or less stations.

▼

It was a pleasure to meet old friends and make new ones at the State Association conventions this year. It was our first visit to the Ohio meeting as Rambler has always reserved this one for himself. Frank McKinney did himself proud as a host and the program was one not soon forgotten. The convention dates for state conventions are carried in each number. We again urge you to attend your state convention this year.

▼

Mr. D. K. Gannett of the Bell Laboratories is an interested reader of TELEPHONE ENGINEER he tells us, and resulted in our including a letter and his discussion giving further information on one of the features of "Short Course in Telephone Transmission" by B. C. Burden now appearing each month. The editor invites other discussions on subject matter appearing in our columns. Shall we have a Vox Pop column? It's up to you!

TELEPHONE ENGINEER

MANAGEMENT · ENGINEERING · MAINTENANCE

Vol. 43, No. 5 **May, 1939**

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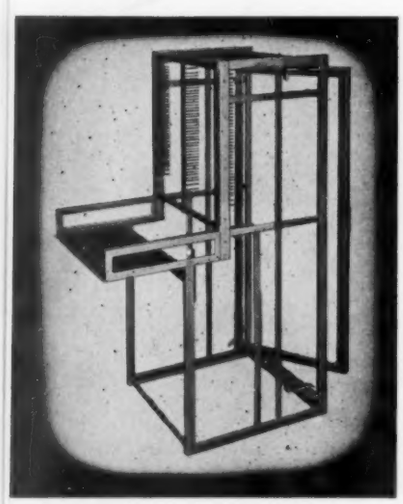

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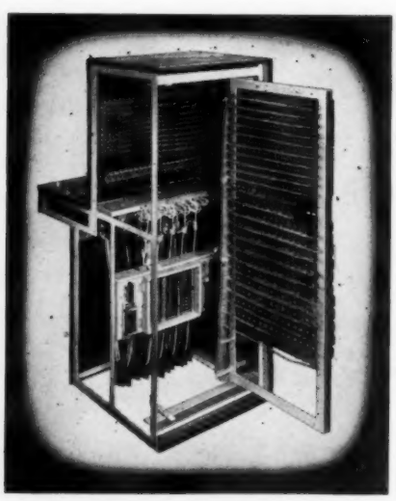

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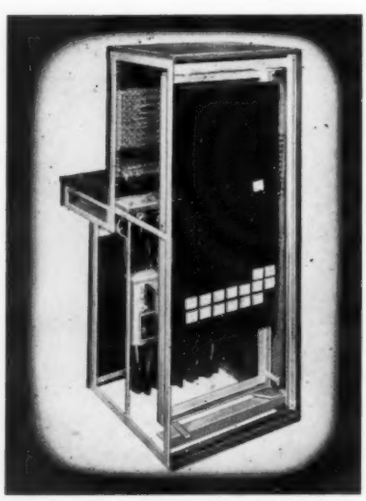

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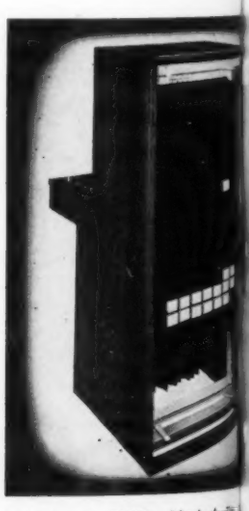

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TELEPHONE ENGINEER
MANAGEMENT · ENGINEERING · MAINTENANCE

MAY, 1939

"Tapping In"

ON WASHINGTON

AND THE

WAGE-HOUR SITUATION

EVEN though action by Congress has been delayed on the Norton Wage-Hour amendments bill, a silver lining in the situation has loomed because it may mean that the House might approve a larger number of stations in the exchanges which would receive the exemption from that statute, the Fair Labor Standards Act.

Because of the powerful opposition from the five leading national farm organizations which were dissatisfied with the measure's exemptions of agricultural labor, Chairwoman Mary Norton of the House Labor Committee was blocked May 15 from her proposal to have the amendments bill brought before the House under a suspension of the rules which would have meant a "gag" passage with all further revisions blocked during its consideration. The farm organizations, headed by the National Grange and the American Farm Bureau Federation, issued an eleventh hour barrage of opposition to the bill and as a result Speaker Bankhead and Majority Leader Rayburn felt that there would be an overwhelming hostility to the Norton measure and advised the House Labor Committee chairwoman not to risk any move for suspension of the rules.

No attempt to have the bill considered on the House floor appeared likely before the third week of May at the earliest. The course which was expected to be followed was for the House Labor Committee to secure a special rule from the House Rules Committee which would permit amendments from the floor and would schedule an hour's general debate with five minutes discussion for each proposed amendment. Representative Cox, veteran Georgia Democrat, who is rated as the de facto chairman of the House Rules Committee, indicated that the Rules body would grant such a request and his statement was viewed as a "tip-off" of the procedure which would take place.

This would mean that the bill can be presented to the Rules Committee within the next week or so and, if a rule is granted, the measure can be called up in the near future for action. Because the House membership is anxious to grant relief from the Wage-Hour law to deserving industries, the prospects for action along this line appeared rather bright.

What this means to the telephone industry is that, instead of the present 500-station amendment which is contained in the Norton bill. Representative Harrington, Iowa Democrat, who has sponsored the idea of a 1,000 subscriber exemption for exchanges, can offer that proposal when the measure is called up before the House. Rep. Harrington has indicated that he plans to present his amendment when the bill reaches the floor.

Mrs. Norton tried unsuccessfully to have the bill recommitted to her Labor Committee but was blocked because the House membership seemed to feel she might entomb the measure in her committee if it was returned. The House Labor chairwoman voiced the threat that President Roosevelt will veto the measure if it goes beyond its present provisions because he wants to maintain the Wage-Hour Act intact.

All in all, the situation over the legislation is so tangled that predictions are rather futile. It may come out for general revision on the House floor under a special rule or it may die entirely without any action at this session.

The telephone amendment has won the support of the majority of the House membership. Mrs. Norton declared in a recent House speech that approximately one-half of the 435 Representatives had personally urged her to give an exemption to the telephone industry. Two other Representatives, Clevenger of Ohio and Hawks of Wisconsin, both Republicans, advocated in House speeches higher exemptions than the 500-station level. Rep. Clevenger stated that, if the Wage-Hour law is applied to small telephone companies there were eight or nine companies in his district that "will either be driven into curtailment of service or into the hands of the A. T. & T." Rep. Hawks stated that the House committee in the Norton bill started with 250 stations and then increased it to 500 "when they know darn well the only thing that will give relief is an exemption of 1,000 stations."

Chairwoman Norton stated that in the telephone exemption amendment of her

By ROLAND C. DAVIES
Editor
Telecommunications Reports

bill her committee "has taken care of the employees in small telephone exchanges." The application of the wage and hour provision to the small telephone companies" in many cases has really tended to increase unemployment and curtail chances for employment," she declared.

The small telephone companies, Mrs. Norton explained, on the whole "are financially unable to comply" with the statute and "the committee believes that by exempting switchboard operators in exchanges having 500 or less stations it will help materially toward solving their present problem." It is felt that Mrs. Norton would not be opposed to an increase of the number of stations, because of her admission that the 500-station level had only "helped materially" in the situation.

Convention Schedule

The Illinois Telephone Association, Pere-Marquette Hotel, Peoria, June 7 and 8.

Wisconsin State Telephone Association and Wisconsin Locally Owned Telephone Group, Park Hotel, Madison, June 13-15.

Washington Independent Telephone Association, Mont Cristo Hotel, Everett, June 23 and 24.

Oregon Independent Telephone Association, Portland Hotel, Portland, June 26.

California Independent Telephone Association, Miramar Hotel, Santa Monica, June 29 and 30.

Michigan Independent Telephone Association, Hotel Olds, Lansing, July 26 and 27.

THE amendment of the present Fair Labor Standards Act as approved by the House Labor Committee will exempt from the wage and hours provisions of that statute only the very small telephone exchanges, and will not afford adequate relief for the Independent telephone companies operating in the Middle Western and Corn Belt agricultural states.

The amendment added a new subsection, numbered 11, to Section 13 (a) of the Fair Labor Standards Act, which is the provision of that law under which exempted industries fall. Under this new subsection exemption from the minimum wage and maximum hours of work per week provisions of the Act would be provided for **"any switchboard operator, during any calendar year, employed in a public telephone exchange**

(Please turn to page 39)

National Association Spring Conference

Clarification of the Wage-Hour Act and discussion of the proposed amendment for exemption of small telephone companies from the confiscatory effect this Act will have received most attention at the Spring Conference of the U. S. Independent Telephone Association held in Chicago, May 15 and 16.

This two day meeting was a business session sans entertainment but chock full of meat for the several hundred executives of the larger Independent telephone companies. Business of the first day was devoted to the Wage-Hour situation, with the REA, toll compensation, commercial and plant conferences scheduled for the final day.

President B. L. Fisher opened the Conference with a short resume of the activities of the Wage-Hour Committee, and a tribute to their accomplishments and unstinting labor on behalf of the smaller telephone exchanges. He then turned the chair over to the Committee headed by Chairman John H. Agee and Vice Chairman, E. C. Blomeyer. The other members comprising, W. C. Henry, J. F. O'Connell and R. A. Phillips were also seated at the speakers table and after a report by Mr. Agee and Mr. Blomeyer of the activities of the committee, which spent many weeks in Washington, the entire assemblage were invited to open discussion. A report on the action of Chairman Norton of the House and her action to bring her omnibus bill, which included the telephone section, before the Congress was heard during the session. Altho the bill was not presented as expected on May 15, it was found that there was a strong possibility of it being brought to vote, with debate, within the next week or so. If amendments are allowed, and it is understood they will be, telephone companies have a chance of raising the minimum now mentioned at 500 stations or less to a larger minimum. The conference extended the committee congratulations and prolonged applause on their work for the Association.

Chas. C. Deering, secretary-treasurer of the association, opened the conference on May 16 with a report on REA and developments on efforts to curt their interference with grounded lines. This was followed by open discussion and presented a clear picture of the damages inductive interference from these lines were causing. Oscar Burton, an association director, entered this open discussion with information on the case the Texas Association had backed whereby the REA was enjoined from energizing their lines before they paid the cost of metallicizing telephone grounded lines affected by their project.

Edwin M. Blakeslee, chairman of the Toll Compensation Committee, presented a report on their activities and of conferences with connecting companies on new problems.

Sam H. Shutt, was chairman in charge of the Commercial Conference which preceded the afternoon plant conference under Chairman E. W. Olschner with a number of suggested subjects for discussion.

(Ed. Note:—Complete resume of the Wage-Hour situation in Washington is given in this issue starting on page 17.)

Short Course in Telephone Transmission

PART IV

By
B. C. BURDEN

Impedance of Typical Telephone Apparatus

IN this series of articles dealing with telephone transmission we have discussed the unit by which transmission is quantitatively measured, the reference level to which telephone transmission is compared, and the effect of impedance mismatching on transmission loss.

The subject of impedance matching is one of considerable importance and will bear further discussion in this issue.

The impedance of any piece of electrical equipment can be computed by the electrical equation:

$$Z = \sqrt{R^2 + X^2}$$

Where: Z—impedance in ohms
R—effective resistance in ohms
X—reactance in ohms.

In other words to compute the impedance we merely square the effective resistance and the reactance, add this result together and then extract the square root of the sum obtained. The impedance of any device represents the total opposition (expressed in ohms) offered by the device to the flow of alternating current of a given frequency through it.

A.C. Resistance Higher Than D.C.

It should particularly be noted that the resistance factor which must be used in the impedance formula **is not ohmic or D.C. resistance** but is the **effective or A.C. resistance.**

Effective resistance consists of the combined resistive effect due to ohmic resistance, eddy current loss, hysteresis loss, and dielectric loss. A special type of instrument is required to measure the effective resistance of apparatus.

THE quantitative difference between the ohmic resistance and the effective resistance is well illustrated by the electrical characteristics of an ordinary telephone receiver, as shown below:

Electrical Data (Telephone Receiver)

D.C. or ohmic resistance..... 80 ohms
A.C. or effective resistance....185 ohms
Reactance (inductive) .....178 ohms
Impedance (1000 cycles) .....256 ohms

With the ordinary D.C. ohmeter our receiver shows a resistance of only 80 ohms, yet, it actually has an effective resistance at 1000 cycles of 185 ohms. This added resistance is due mainly to the power losses caused by eddy current and hysteresis effects. In practical work we are ordinarily not so much concerned with the effective resistance or the reactance of communication apparatus as we are the impedance.

Practical Impedance Matching Problem

A typical example of why we need to have reasonable familiarity with the impedance of telephone apparatus would be the use of an ordinary telephone receiver on the output of a high gain amplifier.

Suppose we wish to use a vacuum tube amplifier for amplifying the feeble voltage picked up by a cable fault exploring coil. It is a relatively simple matter to build up a one or two tube amplifier and to connect a telephone receiver to the output and the exploring coil to the input of the amplifier. The results obtained, however, would be very disappointing. As was previously pointed out it is necessary that the source and load impedance be approximately matched if maximum power is to be delivered to the load. If a telephone receiver having an impedance of 256 ohms is connected to a typical vacuum tube whose plate output impedance is 10,000 ohms, a very inefficient transfer of power between tube and receiver would take place and only a small part of the tube gain could be realized. If, however, a matching transformer was inserted between the tube and the receiver so that the 10,000 ohms plate impedance of the tube was transformed down to approximately 256 ohms (impedance of the receiver) then an efficient transfer of energy would take place. (This would require a transformer whose turns ratio is about 6.24). Fig. 1 illustrates this application of a matching transformer.

Induction Coil Matches Transmitter to Line

In a local battery telephone circuit the impedance of the transmitter which is quite low is partially matched to the telephone line by employing a step up transformer (induction coil) whose **impedance ratio** is roughly 1 to 15. In a two way circuit such as a telephone perfect matching is not feasible as the circuit is used both for transmitting and receiving, hence a 50% mismatch results if transmitter and receiver are

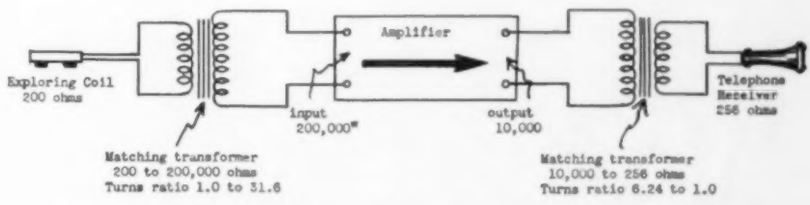

Figure 1—Use of Transformer to match a telephone receiver to a vacuum tube.

to operate with equal efficiency. The design of a local battery set therefore is based on making the impedance of receiver and transmitter (through induction coil) about equal and being in series these two elements approximately match the average telephone line. This feature of telephone instrument design is shown by Figure 2.

Impedance Characteristics of Typical Telephone Apparatus

THE following table lists the approximate inductance, reactance and resistance of various typical units of telephone apparatus. It should be appreciated that the values given are only approximate and that the different makes of receivers, ringers, coils, etc. may depart considerably from the values listed. The conditions (as to measurement voltage used) under which the measurement is made also affects the magnitude of the reading obtained.

The table should, however, prove useful in giving a general idea of the electrical characteristics of typical telephone apparatus.

Table No. 1

IMPEDANCE CHARACTERISTICS OF TYPICAL TELEPHONE APPARATUS AT 1000 CYCLES

Unit	Inductance (henries)	D.C. Resistance (ohms)	Effective Resistance (ohms)	Reactance (ohms)	Impedance (ohms)
Telephone Receiver	.033	80	185	178	256
Telephone Ringer (low impedance type)	.3.2	1000	15,000	18,000	23,400
Telephone Ringer (high impedance type)		3500	80,000	200,000	215,000
C. B. subset		....	550	300	626
Typical C. B. Line Relay		800	10,500	14,000	17,500
C. B. Induction Coil Winding 1-2		14	1100	1000	1485
Winding 3-4		10	500	400	640

The impedance of a telephone transmitter is generally considered as 50 ohms

Impedance Characteristics of Telephone Lines

To those with an elementary knowledge of alternating current, the foregoing explanation of telephone apparatus impedance characteristics is not difficult to follow. It is somewhat more difficult to understand the impedance characteristics and electrical makeup of telephone lines.

A telephone line has **capacity, inductance, resistance, and leakage** and these constants are distributed throughout the length of the line and are not lumped as is the case with telephone apparatus.

Any telephone open wire cable circuit has what is termed a **characteristic impedance.** This impedance is due to the distributed constants (capacity, resistance, inductance, etc.) of the line.

Characteristic Impedance of Telephone Circuits (at 800 cycles)

Type of Circuit	Distributed Constants per Loop Mile				Approximate Line Impedance		
	Ohmic Resistance (ohms)	Inductance (henries)	Capacity (m.f.)	Leakage (m.mho)	Effective Resistance (ohms)	Reactance (ohms)	Impedance (ohms)
No. 104—Copper open wire	10.40	0.00367	0.00835	0.8	688	174.7	710.6
No. 109—Iron open wire	64.00	.....	.....	..	1450	600	1569
No. 16-ga. cable non-loaded	42.20	0.001	0.062	0.868	277.1	245.60	380.0
No. 19-ga. cable non-loaded	83.20	0.001	0.062	0.868	382.3	359.40	524.7
No. 22-ga. cable non-loaded	181.00	0.001	0.073	1.75	492.1	475.80	684.5
No. 19-ga. cable with load coils	93.79	0.1055	0.062	0.868	1316.0	113.20	1321

If we are feeding energy into the line, as for example from a telephone we design our telephone so that its impedance is approximately equal to the impedance of the line. All that has previously been said regarding impedance matching applies to telephone circuits the same as to telephone apparatus.

The characteristic impedance for typical types of telephone circuits is given in the table top of page.

AN examination of the values given in the above table will show that a value of 600 ohms for the average impedance of a telephone line is not far off.

Methods of Expressing Impedance

In a study of alternating currents we learn that any impedance can be expressed either in **polar** or **rectangular form.** This of course, also applies to the characteristic impedance of a telephone line. Let us consider as an example, a No. 104 copper physical open wire toll circuit. The characteristic impedance of such a line at 800 cycles is expressed in **polar form as: 710 ohms at an angle of 14.23 degrees.** In other words such a line would take power from the source in the same manner and phase angle as would a 710 ohm inductance composed of 689 ohms resistance and 185 ohms inductive reactive. To exactly match this line our input source (the telephone) should be of equal impedance and of opposite phase angle. Expressing this impedance in **rectangular form** we would write:

$$Z = 689 + J175$$

which shows at a glance that the circuit consists of 689 ohms effective resistance and 175 ohms inductive reactance.

It is interesting to note that the phase angle in cable is much higher than in open wire. No. 22 ga. non-loaded cable for example has an impedance of 685 ohms at 44 degrees.

In ordinary telephone work we pay but little attention to the exact magnitude of the characteristic impedance or the angle, as we are seldom confronted with impedance matching problems requiring great precision and when we are we usually consider the line as having a characteristic impedance of 600 ohms and match to this value ignoring the phase angle.

Computation of Characteristic Impedance

At first thought it would seem that the impedance of a telephone line would be determined primarily by its length and its resistance. Actually its impedance is independent of its length and as mentioned above depends on the magnitude of distributed constants.

ONE can readily understand that a telephone line would have appreciable capacity due to the proximity of the two wires. The fact that the line would have resistance is also readily apparent. But that a telephone line has

(Please turn to page 38)

Further Notes on the New Volume Unit

By D. K. GANNETT

VU and the New Standard Volume Indicator

ON December 16, 1938, announcement was made of a new volume indicator, together with a new reference level and new terminology for expressing readings of volume level. This development was the result of cooperative work by the National Broadcasting Company, the Columbia Broadcasting System and the Bell Telephone Laboratories, and was undertaken with the purpose of arriving at a technique for measuring volume levels which would be an acceptable standard to replace the variety of instruments and standards in previous use. The Bell System and the two broadcasting companies have set May, 1, 1939, as the date when the new technique will become standard in their plants. This development was discussed with and approved by a number of other organizations and it is hoped that the same standards will be adopted throughout the communication industry.

In standardizing a technique for measuring volume levels, the dynamic and electrical characteristics of the instrument used for the measurement should be specified, as well as the calibration of the instrument. This will be evident when it is considered that a volume level measurement requires reading the maximum swings of a volume indicator meter as it kicks about erratically in response to a rapidly varying speech or program wave. How large these maximum swings are, is determined not only by the strength of the speech impulses and the sensitivity of the instrument, but also by the period and damping of the meter. Suitable values for these characteristics have been determined and rigidly specified for the new volume indicator.

The reference level chosen for the new volume indicator is based on a calibration with one milliwatt of 1000-cycle power in 600 ohms. To earmark the readings so that they will not be confused with readings made with other instruments of different characteristics and calibrations, they are to be expressed in "vu", the number of vu being numerically the same as the number of db above or below the new reference level. Therefore, the volume level in a 600-ohm line is 0 vu when the maximum swings of the meter of one of the new standard volume indicators, which is bridged across the line, reach the same point as the steady deflection caused by one milliwatt of 1000 cycles in the same 600-ohm line.

IT is apparent that it is incorrect to say that 0 vu is one milliwatt or vice versa. A speech wave whose volume level is 0 vu has instantaneous peaks of power which are several times one milliwatt but which are too short for the meter to respond to them, while the average power is a small fraction of one milliwatt. Volume level is an arbitrary but useful quantity, and is simply the reading of a standard instrument which has been calibrated and read in a standard manner.

For the standardization of the new technique of reading volume levels to be effective, the use of "vu" should be restricted to readings made with the new instrument so that wherever the term "vu" is encountered it will be known that it expresses a reading made with instruments having the new standard characteristics. In general, previous types of instruments, even when recalibrated with one milliwatt, will not agree with each other or with the new instrument on each of the various kinds of program and it is, therefore, highly undesirable to describe their readings in terms of vu.

A BRIEF summary of the more important features of the new volume indicator is as follows:

1. Type The meter is a simple copper-oxide rectifier type of meter. No vacuum tubes are required as the sensitivity is adequate for most purposes.

2. Scales—An arbitrary point where it is intended normally to read the meter is located at about 72% of the full scale. This point is marked "O" on one scale called the "vu" scale, and deviations from this point are marked in vu to +3 and to —20. The same point is marked "100 on a second scale, which is proportional to voltage and is marked from 0 to 100. Both scales appear on each meter, but in one form the vu scale is emphasized while in another the voltage scale is more prominent.

3. Dynamic Characteristics—If a 1000-cycle voltage of such amplitude as to give a steady reading of 100 on the voltage scale, is suddenly applied through the proper impedance, the

(Please turn to page 38)

(Editor's Note: We are reproducing herewith a communication and discussion that is self-explanatory. Mr. Burden joins the editor in thanking Mr. Gannett for presenting this timely information for our readers.)

BELL TELEPHONE LABORATORIES

April 4, 1939

EDITORS OF "TELEPHONE ENGINEER"
185 North Wabash
Chicago, Illinois
Gentlemen:

In the article in the February number of your magazine called "Short Course in Telephone Transmission" by B. C. Burden, there appears a short discussion under the heading "New Volume Transmission Unit (VU)." The development, of which this new unit is a part, was only very recently announced and no doubt complete information was not available to the author at the time the article was written. The attached further discussion on this matter may be of interest by way of amplification of the discussion in the article. You are at liberty to publish this discussion if you should so desire.

Yours truly,
(Signed) D. K. GANNETT

A Ready-To-Run Sales Contest, by Zenn Kaufman, Author of "How to Run Better Sales Contests"

HERE is a brand new and exciting way to dramatize a sales contest for telephone companies. It is easy to plan and easy to run.

This contest is based on the theme of "A Race to the Bank", and you visualize this exciting scramble by showing a picture of the actual route from your office to one of the local banks. At the start of the race you deposit in the bank a sum of money sufficient to cover all prizes. On the race route you mark off the distance in ten equal parts. Each part indicates 10% of the quota of installations, P.B.X.'s or extensions. Your employees line up at your office and move toward the bank at the rate of one marker for each tenth of their quota.

Prizes

You can award your prizes to the one who gets to the bank first—or you can offer a prize to everyone who arrives at the bank before the end of the contest or you can award the prizes to those who go over quota by the greatest percentage.

Your bank will be glad to cooperate with you on this and prepare some special passbooks, called Special Account No. 1. These passbooks will be turned over to the winners.

Make It Real

WHEN you draw your map of the route from your office to the bank, put in a great deal of the actual scenery, indicating the location of stores, hotels, etc. Arrange to offer special prizes to the first contestants to pass certain specified spots. For example, pick a candy store near the 50% mark, and arrange with them to put a special box of candy in the window with your name on it. Then announce that the first employee to pass this store gets the box of candy. Make similar deals with men's wear shops, motion picture theatres and other places along the line of march.

The Opportunity for Follow-Up

Use all of the atmosphere of the bank in your follow-up. Get deposit slips and enclose them with your letters to the employees. Take a photograph of the teller standing behind his window, and post this photograph on the wall in your office. Alongside the photograph you can indicate a line of people waiting to get to the window. Put up a "No Loitering" sign near the starting line, and after the race starts print a fake letter from the Police Department complaining of the fact that some of the men have been loitering near the corner of "G" and 8th Streets.

IF there is a hotel on the line of march, get a letter from the hotel asking if certain slow-moving men would like to stop at the hotel for a few weeks. Get up some fake traffic summonses

(Please turn to page 29)

FREE Just send us a self-addressed stamped envelope and we'll send you a copy of the SALES CONTEST CHECK LIST—It should guarantee the success of your next contest.

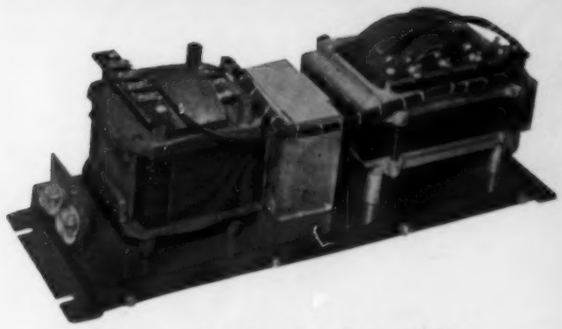

Figure 1—Magnetic AC voltage stabilizer.

Improvements in Automatic Control of Telephone Battery Charging

By
RAY BLAIN

DURING the past few years there has been a gradual change-over from the old manually cycled—manually controlled—method of telephone battery charging to the fully automatic control which operates continually without attention. Many who are now using some type of automatic charging or who may be considering the adoption of this method, it is believed will be interested in learning something about the fundamental improvements which have been made in this system during the past two years. Others may be somewhat familiar with the automatic charge control method but not fully realize that these new features, if used, will result in prolonging considerably the life of the telephone storage battery. Storage battery maintenance is reduced to an absolute minimum by this method and even the addition of water to replace evaporation will not be necessary more than once or twice each year when sealed type glass jar cells are used. Also the closely stabilized DC voltage will prolong the life of the switchboard lamps and permit the proper operation of relays and other apparatus on the prescribed current flow. This stabilized DC telephone power is now readily available in any telephone exchange wherever ordinary commercial AC power can be obtained and its maintenance difficulties have been virtually eliminated.

One type of automatic DC power is particular suited to telephone use. This is the automatic self-regulating charger—also called constant potential or follow-the-load type. A self-regulating charger always operates on a telephone system with a storage battery floated across its terminals and the charger selected must be of sufficient capacity that the battery itself is called upon to carry very little of the load on the system. The result of this is that as long as the load on the system is less than the rating of the charger, its output automatically follows the load and delivers all the power to the telephone system, the battery remaining idle and acting as a power reserve in case of failure of the commercial power. When the load on the telephone system exceeds the charger's rating—as it may during a peak traffic period—the current is supplied partly from the charger—up to its rated capacity—and partly from the battery. The result of this is that the battery works only during peak demand periods or during periods of commercial power failures and during the remainder of the time it automatically receives the correct current to maintain it in a practically fully charged condition and available at all times to operate the telephone exchange if called upon to do so. This battery-charger combination meets the exacting telephone requirements for reliability and economy; first, by insuring a fully charged battery to meet the needs of every emergency within the capacity of the battery, second, by furnishing full voltage continually for the best operation of the apparatus, and, third, by appreciably decreasing the cost of battery renewals as a result of giving the battery very little work to do and thereby extending its life considerably.

AN extensive study made of reports from users of the earlier types of self-regulating chargers indicated that certain design improvements would prove desirable. Through extensive lab-

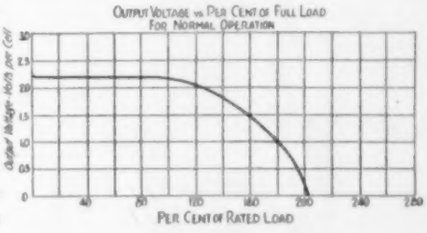

Figure 3

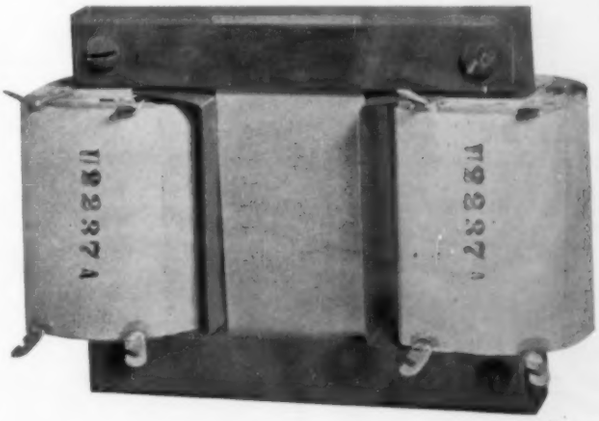

Figure 2—Magnetic DC load regulator.

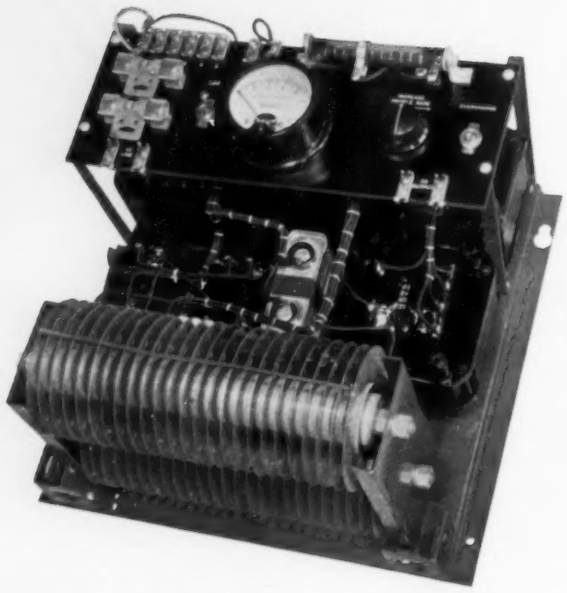

Figure 4—Interior view of one type of automatic charger showing copper oxide rectifying units and trickle rate adjustment.

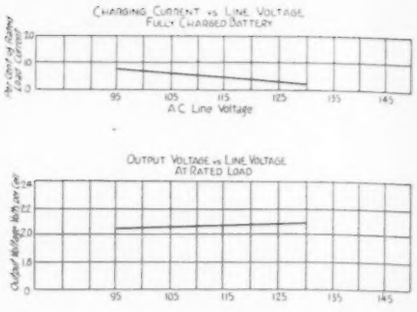

Figure 5

oratory tests and the application of skillful engineering practices it has been possible to develop a charger having the following desirable features; a charger which is practically unaffected by AC line voltage fluctuations over a range of 95 to 130 volts. A manual adjustment of the trickle rate so that when the charger is first installed, the trickle rate may be adjusted to meet the battery manufacturer's specifications for maximum battery life. The chargers are provided with a self-protecting feature so that beyond full load rating the DC voltage falls off rapidly and reaches zero at 200% load. Any tendency for the output to "surge" has been eliminated at this would nullify the advantages of a self-regulating charger by giving the battery what in effect might be called a cylic charge. The control units are fully magnetic and there are no moving parts to adjust, cause trouble or wear out.

Practical telephone men often raise the question as to just how the output of an automatic charger may be magnetically controlled without the aid of moving parts, complicated adjustments or vacuum tubes. To the best of our knowledge an explanation of the principles of this control have not been previously covered in a telephone article and it is believed that they are of sufficient general interest to be explained here in detail.

The control units which give the automatic charging action are saturable core reactors. These are in effect merely special choke coils having two windings similar to the primary and secondary of a transformer. Their design being such that when the DC current in one winding is varied, the impedance (AC resistance) of the other winding varies inversely. In other words, when the DC current is increased in one coil, the AC resistance (impedance) of the other coil decreases. This makes possible a new type of electrical control which operates without moving parts or adjustments and as we shall see later, is used for control purposes in the DC circuit of the charger.

THE AC stabilizer (Figure 1) is an important new feature recently added to automatic chargers after experience proved that even small AC input changes would cause the charger to stop performing its principal function of following the load and follow instead the variations that were taking place in the AC line voltage. For example, a small change of 5% in the AC voltage input reflects itself in the large change of 50% in charging rate approximately. The stabilizer used is of the magnetic —no moving parts—type and holds the AC input to the charger constant at + 1%, even though the AC line may vary 30%, thereby insuring a practically constant voltage input to the charger over an input range of 95 to 130 volts. The AC stabilizer is made up of a reactor, a saturable transformer, and an oil filled condenser.

Next in line is the DC load regulator (Figure 2), which is a saturable core reactor so designed that it gives a practically constant output voltage from the charger over the entire range from zero to full load. Without going into detail on the theory of the regulator's operation it is sufficient to say that it performs exactly the same function in the circuit as if it were a resistor having the special ability to vary its resistance inversely with load (if such a resistor were possible). Then as the current drawn from the charger increases—which would ordinarily tend to cause the DC voltage to fall off—the AC voltage input to the copper oxide rectifiers would be immediately increased by the regulator and this increase in turn would raise the DC voltage back to normal—all this taking place in a very small fraction of a second.

A related feature of the DC regulator is its ability to provide the charger with a self-protection action (Figure 3). It operates in this manner—the regulating action reaches its maximum when the DC current output equals the rating of the charger. Then if any additional current is drawn from the charger over and above its rating, the regulator no longer has the ability to compensate for it, so a sharp drop in voltage takes place and at 200% load it reaches zero. Because of this important feature a charger may be knowingly overloaded by connecting it to a discharged storage battery and its self-

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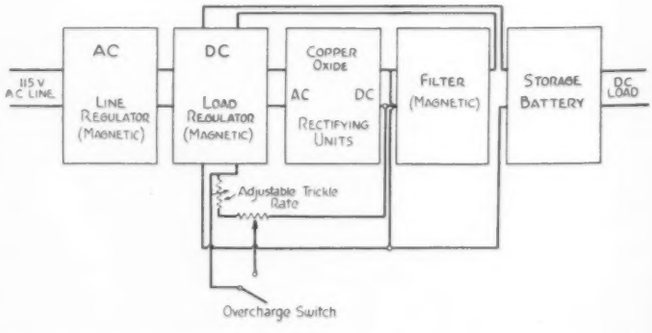

Figure 6—Simplified schematic wiring diagram of the improved type of automatic charger.

State Conventions Face Difficult Problems

In rapid succession the state telephone associations are holding their annual meetings. The all important subject: the Wage-Hour situation. For many of the smaller Independents this subject is almost life or death. The increased attendance at most of the meetings were swelled by the owners of these exchanges whose battle has been waged by the Wage-Hour Committee of the United State Independent Telephone Association. Other matters besides state legislation and new tax proposals was the ever present REA question on who should pay for the damage and interference the governmental financed projects are causing grounded lines of the smaller telephone exchanges.

Starting in Texas which we reported last month, conventions have been held in Oklahoma, Kansas, Missouri, Nebraska, Georgia, Iowa, Ohio and Indiana. Scheduled to follow are Pennsylvania, New York, Illinois and Wisconsin, Washington, Oregon, California and Michigan. Complete schedule is carried in this issue.

At Oklahoma, the convention was preceded by a golf tournament the day before convening. Secretary H. W. Hubenthal was lauded for his good work by Oklahoma speakers as well as commendation from Oscar Burton, president of the Texas Telephone Association and Louis Pitcher, executive vice president of the National Association, both of whom addressed the meeting. Business was tempered with pleasure at the annual banquet held the evening of March 27. All officers and directors were re-elected.

At Kansas those attending were entertained with a golf tournament and on the last day of the two day meeting March 30 and 31, were entertained at Ft. Riley, Kansas, General Richardson, Commanding. R. B. Fegan, of Junction City, where the convention was held, served as a brilliant host.

All officers were re-elected with R. J. Fegan being added to the board of directors. President Samuel Tucker of the Kansas Telephone Association and secretary H. B. Couch presented a very timely program featured by the address of Louis Pitcher on the Wage-Hour situation. Rural service received much attention as Kansas has many small

The candid camera is busy at the Ohio convention. The one identifying 12 in the pictures and naming them will receive a paid-up 3 year subscription. Frank McKinney is barred.

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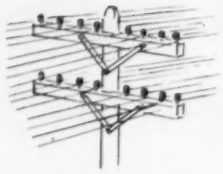
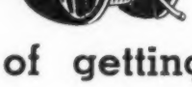


When spring is in the air, outside plant men begin to think of new construction. Poles and crossarms which have failed to withstand the ravages of winter must be replaced. Broken insulators also should be replaced, with "Whitall Tatum" or "Hemingray" products. If new wire is required, we suggest "Perfected" strand , since repair costs or interruptions in heavy-traffic circuits more than offset the price differential between good wire and poor. If drop wire is installed, make it "Copperweld" whose core of steel welded to an outer jacket of solid copper, combines strength with high conductivity. When lead-covered cable is needed, specify "Standard Underground"  for long life and trouble-free service. To be sure of getting only quality products such as these, order all of your supplies from AUTO-

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Guard them against accident with "Klein" safety belts.

If there is tree trimming to do, we recommend "Seymour Smith" pruners,

the only pruner with the "center cut" construction. If you are not already using them, you will appreciate our telling you about the "Dillon" anchor

which saves time

and expense

, since it requires a smaller hole for a like blade spread. And when ordering protection equipment, don't forget that "Sands" products

are the only make regularly equipped with the famous Type 2105 discharge block. Our trucks

are waiting — why not sit down right now and send us an

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companies within its borders. The entertainment at Ft. Riley was the talk of all visitors.

It is gratifying to know that the state associations are more and more appreciative of the manufacturers and suppliers who do so much to enliven their conventions with their exhibits of latest equipment. This year especially have they shown their appreciation by entering orders while at their meetings. This practice is a good one as it means the "regulars" will return next year and redouble their effort in development. We would dislike to vision a telephone convention without the exhibitors.

Missouri selected A. M. Benedict, of the Richards (Mo.) Telephone Company to succeed E. F. Carter of the Missouri Telephone Company, Columbia, who has completed two terms as president J. R. Carter of Perry, was selected as first vice-president, W. R. Journey was re-elected, J. M. Roberts, Gallatin, was elected third vice president to succeed T. R. Schweer, Rolla; and Elmer Weakley, Plattsburg, fourth vice president and R. W. Hedrick, long time able and efficient secretary treasurer, were re-elected.

Retiring president E. F. Carter paid tribute to the workers who so ably battled the elements in the sleet storm of last winter. He especially urged as a remedy to future sleet storms the necessity of buried cable. His comments on taxes, the Wage-Hour situation and a complete resume on the state of the telephone industry in Missouri were timely. Speakers included R. B. Still, president of the Illinois Telephone Company, Bloomington; J. R. Carter, Home Telephone Co., Perry; Ranford Dunlap, of Ft. Wayne, Ind. and Louis Pitcher of the National association who discussed "Telephone Situation in the Nation." H. B. Whatley, Southwestern Bell Telephone Company presented a traffic demonstration and John F. Cline, district manager of the Fidelity Telephone Company, of Sullivan, directed the plant and maintenance program and conference.

At the Nebraska convention held in Lincoln, April 11 and 12, C. L. Kelly of North Bend, was elected president to succeed D. E. McGregor, Gibbon, who has completed his fourth year as its chief executive. E. C. Hunt, president of the Blair Telephone Company was named vice president to succeed A. B. Clark, Columbus; and Charles A. Patterson, Arapahoe Telephone Co. and H. L. Fentress, of the Northwestern Bell were selected to the directorate. George F. Kloidy, Nebraska's well-known association secretary and treasurer was re-elected.

Discussions were heard on the REA situation and the opinion of the Chairman of the state railway commission was to the effect that this agency must obey Nebraska laws. Mr. McGregor stressed better public relations with the farmer, in his address, as one way to combat the ruinous effect new laws are having on the telephone industry. C. C. Deering, secretary of the National association spoke on National Affairs and the Wage-Hour problem. John H. Agee, Lincoln Tel. & Tel. Co., discussed "In These Trying Times" and in this discussion gave a graphic picture of the work done by the Wage-Hour Committee of the National association of which he is Chairman. Accounting was also a subject receiving attention.

Iowa had its largest attendance in recent years at its 44th annual convention held in Des Moines, April 18, 19 and 20. A. J. Adams, Chariton, was succeeded by Phil Zerwas, manager of the Manning (Iowa) Telephone Co., as president. All other officers were re-elected. In his address to the convention Secretary-treasurer C. C. Deering presented a complete resume of the Association year and the political aspect faced and to be faced. Other speakers included M. C. Hagen, Waterville; Purley Rinker, of Centerville, on the subject "Democracies vs. Dictatorships;" Louis Pitcher, of the National Association; R. A. Phillips, Sioux City, vice president and general manager of the Central Electric & Telephone Co., who presented "Some Rural Problems"; John H. Agee, of Lincoln, Nebr.; and G. L. Howorth, of the Northwestern Bell.

The Ohio association always has a very high attendance mark and this year was no exception. The two-day session, held April 25 and 26, at Columbus, was one of the liveliest and best attended of recent years. Present officers, headed by J. T. Carliss, of Marion, as president, were re-elected. Vice-president is J. W. Safford, Troy and Frank L. McKinney, Columbus, the secretary-treasurer. Directors selected were: Henry George, Ashland; Frank

The Right Hon. Sir Kingsley Wood talking to a number of technicians of the Portugese Government who are temporarily resident at the Strowger Works to obtain full knowledge of the bulk contact equipment to be supplied to their government over a period of 15 years.

An important advance in the Government's plans for increasing aircraft production took place on Monday April 3rd when the Foundation Stone of a large new extension to the Strowger Works, Liverpool, of Automatic Telephone & Electric Co., Ltd., was laid by the Secretary of State for Air, The Rt. Hon. Sir Kingsley Wood M.P., in the presence of the Lord Mayor of Liverpool (Alderman Sir Sidney Jones), The Rt. Hon. The Earl of Derby, K.G. and a number of distinguished guests.

The extension consists of a large four-story building which is being constructed exclusively to handle Air Ministry contracts. The building is, in fact, almost completed so that Sir Kingsley's act of laying the Foundation Stone really symbolizes the placing into the nation's service of the huge new workshops.

Upon arrival at Strowger Works, Sir Kingsley Wood was received by Six Alexander Roger, Chairman of Automatic Telephone & Electric Co., Ltd., Mr. T. A. Eades, Managing Director, Mr. F. C. Burstall, Commercial Director, and Mr. A. F. Bennett, Manager and Local Director.

Binkley, Bellefontaine; J. W. Safford, Troy; A. S. Crane, Portsmouth; J. F. Smith, Cadiz; and Ralph Mateer, of Warren who is the only new member.

The entertainment hit a high mark with the presentation of Gov. John W. Bricker, former member of the Ohio Public Utilities Commission, who was the feature speaker at the banquet. Dancing was enjoyed until late. The ballroom was opposite the exhibit rooms and the exhibitors held open house and joined in the festivities.

The president Mr. J. T. Cariiss, in his annual address, was very optimistic over the future for Ohio telephone men. He too, presented a resume of the association year and presented statistics gathered by the association to prove his points. In his annual report secretary Frank L. McKinney assured the members of the improved conditions that he contended were fought for in comparison to methods used in other trade organizations who are prone to show the courage set by the telephone industry. Louis Pitcher addressed the meeting as the executive of the National Association, with discussion of the Wage-Hour situation and the danger of postalization of toll rates. Other speakers were Claris Adams, Columbus; Frank M. Stephens, Ohio Bell, Cleveland; Milton E. Kraft, Columbus, and A. J. Allen, president of the Cincinnati & Suburban Bell Telephone Co. Gustav Hirsch, Columbus, also addressed the meeting on conversions.

Allen S. Crane, general manager of the Portsmouth Home Telephone Company, and E. F. Woodward of the Northern Ohio Telephone Co., presented jointly the discussion "Campaigning for New Business in 1939" Mr. Crane handled the employee selling and employee sales campaign portion while Mr. Woodward discussed selling through the medium of paid salesmen. This subject is an all-important one to the Independent telephone industry at the present time, and as Mr. Crane pointed out, needs application to bring back station installations that were lost during depression times. Mr. Woodward outlined an employee sales campaign now being used in the company he represents which was adapted from the plan of the Lincoln (Nebr.) Tel & Tel. Co., who have been using the plan very successfully for the past few years.

W. C. Henry, Bellevue, general manager of the Northern Ohio Telephone Company, is a member of the Wage-Hour Committee of the National association, and was well qualified to present "What's Worrying You" as his subject. He discussed at length the Wage-Hour problems that faced the Committee in their fight for an amendment to the present law.

Sales Contest

(Continued from page 22)

and issue some of them to the men who are "blocking traffic" by travelling too slowly. Then get up some summonses for speeding and "threaten" to issue these speeding summonses for real action. Then announce that all men receiving tickets for speeding can get their tickets "fixed" by presenting them at your office any morning before court opens. "Fixing" means that tickets can be turned in for brand new dollar bills.

At least one of the letters in this campaign should be got out on the letterhead of your local bank, commenting on the fact that the money is on tap, waiting for some fast-moving sprinter to break down the door and take it. Other letters can go out on the letterheads of the stores along the route, commenting on the fact that "Joe Doakes just tore past our corner at breakneck speed, with Minnie Smith practically on his heels."

New Orleans Ship-to-Shore Service

Authority to operate a coastal and harbor telephone station at New Orleans has been granted the Southern Bell Telephone and Telegraph Company, Inc., by the federal communications commission.

George Watts Dies Suddenly

George Watts, manager of the Knightstown (Ind.) Telephone Company died of heart failure at Indianapolis, on the evening of May 10, while attending the convention of the Indiana Telephone Association. Death came as a surprise to his friends as the day previous he had played golf and apparently was in the best of health.

A. T. & T. To Spend $320,000,000

The Bell system contemplates spending $320,000,000 this year for plant expenditures and improvement, an increase of $25,000,000 over 1938, Walter S. Gifford, president of the American Telephone & Telegraph Co., told the annual stockholders meeting on April 19.

The telephone system, he said, has reached an "all-time high" of 16,000,000 telephones in service—800,000 more than in the "pre-depression peak in 1930." He said that only in the northeastern section of the country were there fewer telephones today than in 1930.

More than 500 stockholders gathered in the company's building on lower Broadway to hear Gifford's remarks and to re-elect directors.

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ANY NEW diagonals will CUT. But—HOW LONG WILL THEY CONTINUE TO CUT is another story. Vacuum Grip Diagonals (hammer forged from special formula high carbon alloy tool steel of inconceivable toughness) *retain their cutting power over abnormally long periods.*

You pay a shade more for them—but when you figure that they outlast ordinary diagonals in the ratio of one to six or eight pairs, the CUT IN COSTS made possible by their use looms up big as an economy factor.

The patterns illustrated are identical in basic features. Perfectly matched hand-edged cutters. Permanent alignment assured by extra strong joint construction. Correct balance. "Comfortable" handles. Leverage that multiplies hand power tremendously. And—we again emphasize it—*Steel!*

87—SPECIAL HEAVY DUTY PATTERN. "The King of Diagonals." A giant in performance. Over 200,000 in use. Length, 7"—$2.50.
86—HEAVY DUTY PATTERN. For work that requires diagonals of medium size. Oversize cutting capacity. Length 5"—$2.00. No. 85—5"—$1.65.
186—STANDARD PATTERN. A favorite with electricians and switchboard mechanics. Light yet powerful. Edged to cut insulation as well as wire. Length —6"—$1.90. No. 185—5"—$1.75.

LINEMEN: Order a pair on trial. Purchase price refunded if after 30 days you are not satisfied. PURCHASING AGENTS: Ask for prices on lots of six or more pairs. Order two or three pairs now for running tests.

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OVER A MILLION VACUUM GRIP PLIERS ARE IN DAILY USE

LINE and DESK

RAY BLAIN, Member A. I. E. E., Editor

Q. When using the eye bolt method of guying on an open wire line can an eye nut be used on the end of the through bolt for attaching the guy?

A. While perhaps this method could be used it is not ordinarily recommended. A separate eye bolt to support the guy should be placed approximately 4" below the bottom of the top crossarm of the open wire lead.

Q. We are using oak brackets and pole steps which have been dipped in red paint and would be pleased to know whether this is considered adequate protection?

A. This dipped paint method has little, if any, protective value and we would suggest that they be dipped in a hot bath of Creosote oil. This treatment will increase the cost of the material very little and we believe will prove a good investment.

Q. Does the self contained handset have any real advantages over the old style variety for use in the average exchange?

A. We are of the opinion that it has many qualities which may be considered superior to the old fashioned variety. In the first place this new styled instrument is small, neat and compact. It is also more convenient to install as only the small terminal block need be permanently attached to the desk or wall. We are of the opinion that this type will undoubtedly be the telephone of the future.

Q. Which is ordinarily considered best in the average medium sized exchange, a 100 pair or 200 pair of protectors per vertical on the main frame?

A. Either would prove satisfactory though we believe the 200 pair vertical is best for an exchange having 800 or more cable pairs in the outside plant. This arrangement makes a more compact main frame and requires less floor space. Such a main frame requires a ceiling height of at least ten feet. Some object to the 200 pair vertical main frame as they claim it requires a ladder for all jumper work. This is a poor argument for a ladder of some type is generally required for even the 100 pair vertical. We recommend the roller ladder type installation for all exchanges when ladders are required.

Q. We have a grounded rural line which is conected metallic through the exchange cable. Recently this line developed trouble and was cleared by reversing the cable pair. We are at a loss to know how this cleared the trouble. Can you explain?

A. We are of the opinion that you have a ground on one side of the metallic section, probably on the main frame or in the switchboard. When the cable pair was reversed the two grounds were transferred to one side of the line leaving one side of the pair clear. Now your line is working grounded to the fault on the main frame or switchboard. Prior to the reversal of the pair you had a ground on each side of the line.

Q. Is it true that a chemical can now be used to replace hot paraffin for drying out conductors of a paper insulated cable?

A. Yes such a chemical desiccant is now being tested for this purpose and from all indications has a good chance of success for some types of cable work. This drying agent is an inert chemical which is used in granular form. It is scattered through the conductors and is left in the splice permanently. This chemical comes packed in moisture-proof cans as it absorbs moisture rapidly from the atmosphere when exposed. Splices cannot, however, be dried out as rapidly with this chemical as with hot paraffin.

Q. We have a 11-cell storage battery on our telephone system and would like to know whether we could improve the operation of our relays and boost transmission by adding an additional cell to the battery?

A. We would not recommend this change as no doubt your switchboard is designed for operation from 11-cells of lead-acid battery. If your relays do not operate satisfactorily and the battery voltage is up to normal we would suggest that they be checked and re-adjusted by the current flow method. An increase in the battery voltage might cause damage to the transmitters on short subscribers loops.

Q. Can you advise us whether the cable laying plow is now considered a success and how they are used?

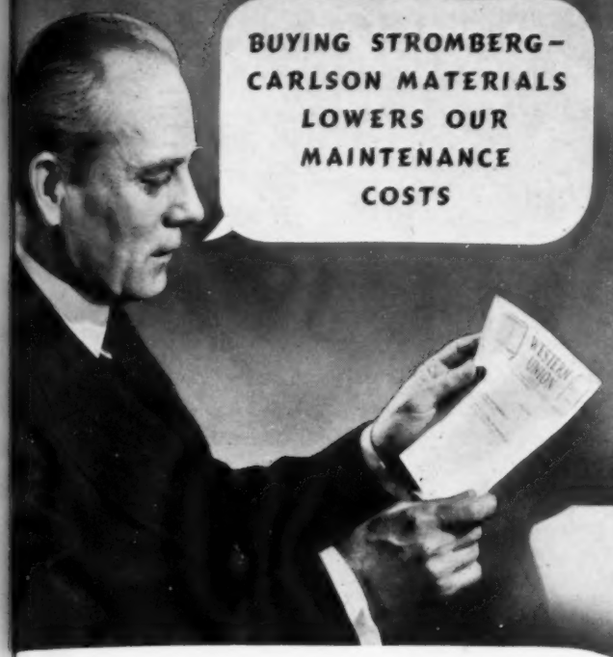
A. These plows have been considerably improved during the past few years and are now both successful and economical for large cable jobs. The combined use of the rooter plow and the cable laying plow are used as follows; The rooter plow is run over the territory on the exact location where the cable is to be laid. The purpose of this plow is to cut roots, break-up hard soil and clear other obstacles. Although the earth will fill in the small slot made by the blade, the way is broken for the cable laying plow. Then the cable laying plow is attached directly in the rear of the cable reel trailer which carries the cable being laid. The cable is threaded through the guide and the end anchored. The cable laying plow follows exactly the same course the rooter traveled which broke the trail and cleared the way and the cable laying is permitted to proceed smoothly without danger of damage. A backfiller can be attached directly in rear of the cable laying plow to replace the small amount of earth disturbed. Sometimes a tractor is run over the disturbed earth to repack it in place.

Q. What is stripping oil and how is it used in cable splicing?

A. Cold stripping oil is a light mineral oil now being used experimentally for the impregnation of the insulation of conductors to facilitate removal of the wire covering in the splice. This oil should be applied sparingly to the conductors being spliced with a suitable brush.

Address Questions to Line & Desk Editor

Ray Blain



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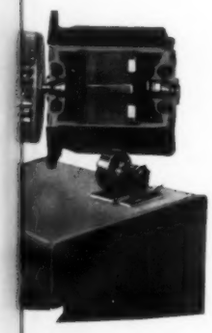
Sturgis Posture Chairs

These metal chairs are designed to insure correct posture on the part of the operator. Consequently, she works with less fatigue. Available in any combination of six different backs and six different seats; a choice of cane, upholstered leather or frieze fabric; several colors.



"Bon-Air" Telephone Booth Ventilator

Keeps fresh air constantly in motion in the telephone booth. Mounted out of sight on the top of booth at the rear. It starts automatically when the door switch is closed. Fibre fins supply air to the interior. Requires only a 25 watt input.

Habirshaw Wire

Habirshaw Ecco Brand Telephone Wire is supplied in many sizes of the following types: Bronze Drop Wire, Bridle Wire, Pothead Wire, Interior Wire and Jumper Wire.

Everstick Expanding Anchors

An ideal guy anchor for all-round use—built to hold strains 100% greater than rated holding power of ordinary soils. Furnished in 2-way, 3-way and 4-way types. (3-way type illustrated).

Crapo Double Galvanized Telephone and Telegraph Wire

Drawn from special steel and double galvanized—has heavy zinc coating offering maximum resistance to corrosion—can be wrapped in its own diameter without cracking, flaking or peeling—guaranteed to conform to all standard specifications.

Cook XB Unprotected Terminals

Cat. No.	Capacity	Weight, Pounds Less Stub	With Stub
3503	11-Pair	5	12
3504	16-Pair	5	12
3505	26-Pair	8	22

Reliable RU Unprotected Terminals

Capacity	Ship. Wt. Pounds Less Stub	With Stub
11-Pair	10½	15½
16-Pair	12¾	19
26-Pair	18¼	25

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STROMBERG-CARLSON TELEPHONE MANUFACTURING CO.
FACTORY AND GENERAL OFFICES: 100 CARLSON RD., ROCHESTER, N. Y., U. S. A.
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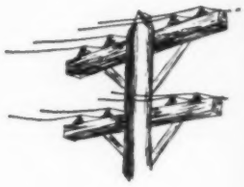
Stromberg-Carlson

MAKERS OF VOICE TRANSMISSION AND VOICE RECEPTION APPARATUS FOR MORE THAN FORTY YEARS

LONG LINES



R. A. Clark, Jr.

Blakeslee Single Line Telegraph Repeater

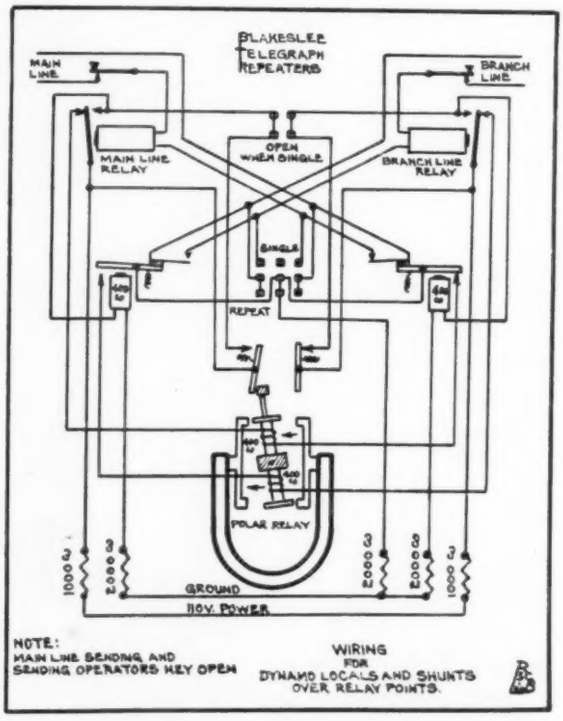
A SINGLE line telegraph repeater having several unique features to permit high speed telegraph operation was developed a few years ago by R. C. Blakesley (Pat. 3-20-23). The main feature of the circuit, which is shown in Fig. 1, is the use of a polar relay to give the interlocking feature. The polar relay contains two windings each of which is 400 ohms. Two sets of contacts are required as shown in the figure. The main relays are ordinarily telegraph type of 100 to 150 ohms resistance equipped with a back contact. The auxiliary relays may also be of this type. Considerable success has been had with telephone type relays for this application the relays having a screw adjustment for spring tension. The contacts should be somewhat heavier than normally used in telephone service. Once adjusted these relays will operate for long periods of time without requiring any change through weather cycles. A five pole double throw switch is provided for transferring from single to repeater operation.

The current required for the auxiliary relays depends somewhat on the type used. With the telegraph type, a current of 30 milliamperes is satisfactory. The series resistance should be suitable for the voltage used. Proper values are shown below for battery voltage commonly used.

	Resistance on relay armature side	Resistance on transmitter and polar relay coil side
110 volt local	1000 ohms	2000 ohms
160 volt local	1500 ohms	3000 ohms

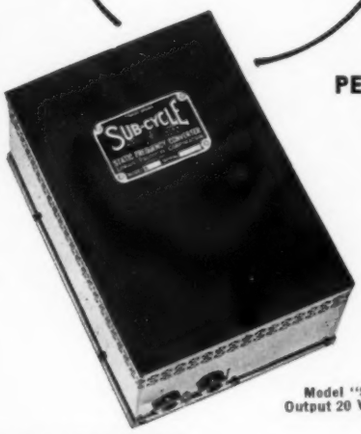
The circuit is operated in the following manner: The operator on the receiving line wishing to break, opens his key, which opens the receiving line and therefore opens the receiving line relay allowing the armature to rest on the back contact. With the sending relay closed, (or at its next closing and therefore transmitter on sending side closed) a circuit is completed through one winding of polar relay by current flowing from local, to armature of receiving relay, to back contact, to polar relay coil, to anvil of sending transmitter, to armature of that transmitter, to center blade of singling switch and back to local. This will cause the polar relay armature to travel over to the other side and the extension on the armature will allow the shunting switch, which has been held open, to close and will open the opposite switch, reversing the condition which existed and making the receiving line the sending one and vice-versa. The relay operating these switches, being polar, makes it necessary when the set is installed to connect its windings in the proper manner so that the armature will open the shunting switch on the side which is breaking. Should the operation be reversed it would simply be necessary to reverse the wires on the coils of the polar relay causing the current to travel in the opposite direction through the polar relay coil.

THE shunting switches are connected to the armature and front contact of line relays, one side of each of these two circuits being cut through the blades of the switch marked "OPEN WHEN SINGLE." These contacts are opened when the repeater is singled so



SUB-CYCLE

The MASTER Ringing Converter



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PRICE

Model "S" Output 20 Watts **$45.00**

NO MOVING PARTS
VIBRATING CONTACTS
ROUTINE MAINTENANCE
RADIO INTERFERENCE

Outputs — 20 or 50 watts
Prices — $45.00 to $113.50
ALSO PULSATORS

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Address Foreign Inquiries to Automatic Electric Sales Co. Ltd., Chicago, Ill.

Easy to Drive
STIFF STEEL CORE

Non Rusting
THICK COPPER EXTERIOR

COPPER-TO-COPPER — ROD TO WIRE CONTACT

MORE *Dependable* GROUNDS ..... AND *Economical*, TOO

COPPERWELD
NON-RUSTING
TELEPHONE
GROUND RODS *and* CLAMPS

Help your Operator...

with the new Model 33 CALCULAGRAPH

Help your operator get more accurate results on toll calls.

COMPACT—7½"x3⅜". Takes up minimum space on switchboard.

UNOBSTRUCTED VIEW—Full vision of dial from any position on the switchboard.

SWEEP SECOND HAND—Tells the end of the initial period at a glance.

There are other new features you will appreciate.

Write for information.

THE CALCULAGRAPH COMPANY
308 Sussex St. **Harrison N. J.**

that neither will shunt the relay points, allowing both transmitter relays to operate as sounders when the set is single.

Since the shunting switch on the receiving side is always closed, the transmitter on that side will also be closed, for this switch makes a path for the local through the transmitter coils, regardless of whether the relay is open or closed. This in turn maintains a closed circuit for the sending line through the tongue and post of the receiving transmitter during the time the opposite line is sending.

The following rules will be of value in placing the equipment in operation. First throw switch to single position and adjust the line relay, then throw switch to repeat position and adjust polar and auxiliary relays. All air gaps should be kept small with reasonably high tension on the retractile springs. Once properly adjusted no further change will be necessary during weather changes. Whatever changes are required due to line variations should be made in the line relay adjustments.

Figure 7—Exterior view of one type of automatic charger.

IMPROVEMENTS IN AUTOMATIC CONTROL OF BATTERY CHARGING

(Continued from page 24)

protecting action will automatically hold the current to a value which will prevent the AC fuses from blowing.

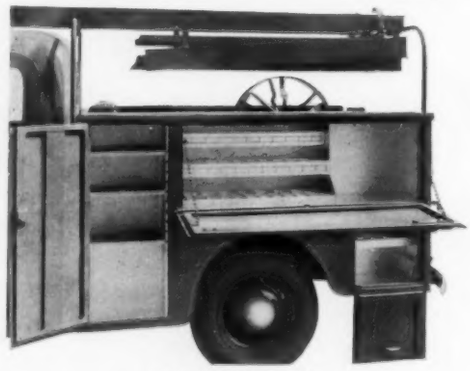
ANOTHER improvement in connection with the DC regulator is the manual adjustment of the trickle rate illustrated in Figure 4. This arrangement is absolutely necessary in order to meet the battery manufacturers' specifications for maximum battery life. A variable resistor is the means of making this adjustment and it is connected in the circuit to control the actual value of the voltage delivered to the copper oxide rectifying unit. The adjustment need be made only at the time of the original installation and remains fixed thereafter for long periods of time.

Following the DC regulating unit in the circuit are dry disc copper oxide rectifying units illustrated in Figure 4 which perform the function of converting AC into pulsating DC. Life tests still running after fifteen years at the rectifier manufacturer's factory indicate an indefinite life expectancy and because they are not expected to wear out, unless the charger is abused, these copper oxide rectifying units have been selected as being the most appropriate rectifiers for telephone service.

By connecting the copper oxide rectifiers in a full-wave bridge circuit rectification of both sides of the AC wave is obtained. However, this DC is not sufficiently hum free for the satisfactory operation of a telephone system and a choke coil is added to the circuit to act as a filter and reduce the DC pulsations to a point where they can not be heard on the telephones. This together with the filtering action of the connected storage battery gives an attenuation of at least -60DB and at that low level the human ear cannot detect even a trace of hum.

Numerous users of automatic chargers wish to be able to switch off the automatic controls for the purpose of giving the storage battery a so-called, "equalizing," "soaking," or "overcharge," occasionally. A manual "off-on" switch is used to provide this feature and in the "off" position it has the effect of reducing the resistance (by analogy) of the DC regulator and increasing the output DC voltage to a fixed and predetermined point. As long as the switch is in the "on" position the charger loses its follow-the-load characteristics and operates at a fixed output voltage until the switch has been returned to the "off" position.

THE improved automatic self-regulating chargers are made for the usual telephone DC voltages in capacities up to 6 amperes. When higher current capacity is required, identical sizes may be connected together in parallel with the load dividing exactly fifty fifty and with no tendency for one charger to carry more nor less than its share of the load. However, in making the parallel connection chargers must be selected that have never been used, because the copper oxide rectifying units



RURAL INSTALLATION AND MAINTENANCE TELEPHONE BODY

Type 4551 Body

THE IDEAL UNIT FOR SERVICING RURAL LINES

Low price permits purchase of more units. Specifications and prices on request.

AMERICAN BODIES

Are Dependable for Every Public Utility Service

Side Ladder Mounting

LARGEST EXCLUSIVE MANUFACTURER OF STANDARD PUBLIC UTILITY EQUIPMENT

THE AMERICAN COACH & BODY CO.
CLEVELAND, OHIO

DORSON'S *Toll Timer* WILL BE

AT THE STATE CONVENTIONS

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Foolproof

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Unconditional Guarantee

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40 Hour Lever Movement

•

$22.50

Look for Dorson's Toll Timer in your supplier's exhibit. Just as you can help the Association by attending, so can the Toll Timer help you eliminate subscriber arguments over toll calls. Many in the telephone field are singing the praises of Dorson's Toll Timer.

Write your supplier today.

DORSON CORPORATION

MFG'S OF TIME STAMPS, SWITCHES & WATCHMEN'S CLOCKS

—— OVER 25 YEARS OF SERVICE ——

605 Washington Blvd. Chicago

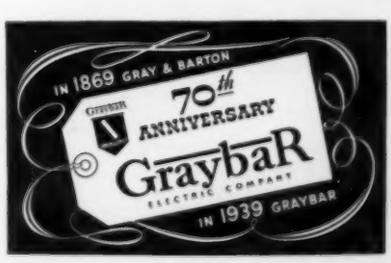
"YOU CAN DEPEND ON PRODUCTS FROM GRAYBAR"

Ask telephone people who *know from experience* . . . purchasing agents . . . executives . . . linemen . . . operators. They'll tell you products from Graybar are *dependable* products.

Graybar has been meeting the electrical supply needs of telephone companies since the telephone industry was born. Today, Graybar still serves America's telephone companies . . . with an insight and understanding resulting from three generations of experience in meeting telephone company supply requirements.

You can rely on Graybar *products* . . . Graybar *service* . . . Graybar *men!* Call Graybar for electrical supplies for telephone company use.

BOOTHS



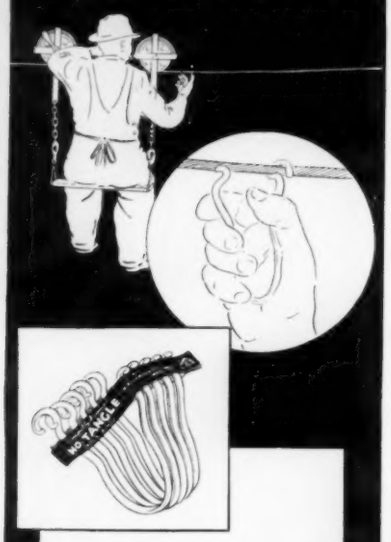
CABLE

TOOLS

POLE LINES

OFFICES IN 83 PRINCIPAL CITIES • EXECUTIVE OFFICES, GRAYBAR BUILDING, N. Y.

NO-TANGLE
CABLE RINGS



Make Cable Hanging Easier and Better.

A "Simple little twist of the wrist," and they're on — that's about all there is to the installation of No Tangle Cable Rings, because they are so designed that the spiral hook wraps itself around the messenger and permits a leverage action that practically eliminates the necessity of gripping. The package, too, is an aid to installation, because rings are held firmly together so they cannot turn, twist or tangle, and being packed in boxes, they are easily stocked and identified.

Once on the line, No Tangle Rings don't slip, swing or jump, because the spiral hook grips the strand tightly and the shoulder on the short hook prevents jumping up. The smooth rounded bearing surface makes it easier to pull cable through No Tangle Rings without cutting or binding and prevents excessive sheath cutting after the job is done.

Every No Tangle Ring is individually inspected and checked for rough protuberances that cause sheath wear. Every ring has a smooth galvanized finish.

Consider all these features, compare them and you will specify No Tangle Rings on your next order.

A·B·CHANCE CO.
CENTRALIA, MISSOURI

increase their resistance with use. If the resistance of both chargers are not approximately the same the load will not divide equally and successful parallel operation will not be possible.

When provision must be made for an increasing future load, an automatic self-regulating charger may be purchased at the beginning to carry the existing load and then later when additional current is required, a manually adjusted constant current charger may be connected to it in parallel and the second charger switched in and out by means of a current relay or by means of a time clock set to connect it at the beginning of a peak traffic period and to disconnect it and the end of the period.

SOME telephone men when they read this may be of the opinion that the self-regulating type of rectifiers are too complicated for their use, though nothing could possibly be further from the truth. While it is true that several special design features are used they all tend to simplify rather than complicate its operation. The writer personally knows of one installation where a self-regulating rectifier has been in continuous service for several years without any attention and absolutely without trouble. When the rectifier was purchased several repair parts including extra rectifier units were obtained for the purpose of making rapid repairs in event of trouble. None of these parts have as yet been required and present indications are that they never will be.

Progressive telephone men are pleased to note that all apparatus used in the industry is being simplified constantly and made more reliable in its operation. This self-regulating rectifier is just another step forward in the parade of progress toward an easier life and better profits in the telephone business. It is urgently recommended that anyone contemplating the installation of a new storage battery or a change in their present charging equipment give serious consideration to the installation of self-regulating rectifiers.

New Inventions Patented

Edited by GAILLARD HUNT, Patent Attorney
McLachlen Bldg., Washington, D. C.

Systems

2,143,163 CARRIER COMMUNICATION SYSTEM. Newton Monk, New York, N. Y., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York. Jan. 10, 1939.

High frequency, with wave selective means at each station which will indicate the wanted station when its designation is sent out by the calling station.

▼

2,143,563 SYSTEM FOR SECRET MULTIPLE-CHANNEL CARRIER INTER-COMMUNICATION. Sol J. Levy and Joseph Laurence Cassell, New York, N. Y., assignors to International Carrier-call and Television Corporation, New York, N. Y. Jan. 10, 1939.

Utilizes an electric network, with a source of unmodulated carrier frequency control energy and has two or more sets of transmitters and receivers each set operating on a different harmonic of the carrier.

▼

2,144,380 INTERCOMMUNICATING SYSTEM AND METHOD. Louis W. Parker, Astoria, N. Y., assignor to S. M. Saltzman, New York, N. Y. Jan. 17, 1939.

Call system for signalling from several outlying stations to a central station.

2,144,866 TELEPHONE SYSTEM. Louis M. Allen, Dongan Hills, N. Y., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y. a corporation of New York. Jan. 24, 1939.

Testing device for automatic system whereby dialing a number will automatically set up a plurality of test connections.

▼

2,144,867 TELEPHONE SYSTEM. George E. Atkins, Glen Ridge, N. J. assignor to Bell Telephone Laboratories, New York, N. Y., a corporation of New York. Jan. 24, 1939.

Batteryless type house or interphone.

▼

2,145,079 TELEPHONE SYSTEM. Earle S. Gibson, Ridgewood, N. J., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y. a corporation of New York. Jan 24, 1939.

Call transmitter with impulsing relay and ionizing tubes.

▼

2,145,095 TELEPHONE SYSTEM. Fritz Pfleiderer, Berlin-Wilmersdorf, Germany, assignor to Siemens and Halske Aktiengesesellschaft, Siemensstadt, near Berlin, Germany, a corporation of Germany. Jan. 24, 1939.

Multiplex system for voice and signals, utilizing balancing transformers for metallic connection for signals.

▼

2,145,667 WATCHMAN'S SERVICE SYSTEM. Norman H. Saunders, Homewood, and Morris E. Griffins, Western Springs, Ill., assignors to Associated Electric Laboratories, Inc., Chicago, Ill., a corporation of Delaware. Jan. 31, 1939.

Telephonic reporting stations and a central station which has a switch automatically advancing from one station to the other.

▼

2,145,717 MULTIPLEX TELECOMMUNICATION SYSTEM. William G. H. FINCH, New York, N. Y. Jan. 31, 1939.

Portable device for transmission of picture signals from telephone stations, without physical connection with the telephone.

▼

Exchanges

2,143,589 TELEPHONE SYSTEM. John Wicks, Oak Park, Ill., assignor to Associated Electric Laboratories, Inc., Chicago, Ill., Jan. 17, 1939.

Non-rotary automatic exchange, including stepping magnets and an actuator movable in three directions.

▼

2,143,971 TELEPHONE SYSTEM. Roy Melville Brazelton, Chicago, Ill., assignor to American Telegraph and Telephone Company, a corporation of New York. Jan. 17, 1939.

Automatic exchange, with device for automatically connecting calling station to operator if no directive impulses are received after 30 seconds.

▼

2,145,094 TELEPHONE SYSTEM. Edward S. Peterson, Edmund Park, Ill. assignor to Associated Electric Laboratories, Inc., Chicago, Ill., Jan. 24, 1939.

Auxiliary automatic exchange for rural suboffices.

Instruments

2,143,097 TELEPHONIC UNIT. Herbert R. Warnke, New York, N. Y., assignor to Control Instrument Company, Inc., Brooklyn, N. Y., a corporation of New York. Jan. 10, 1939.

Telephone with magnet and pole pieces.

▼

2,143,404 ACOUSTIC DEVICE. Herbert W. Bryant, Brooklyn, N. Y., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York. Jan. 10, 1939.

Moisture trap in mouthpiece.

▼

2,143,675 SANITARY DEVICE FOR TELEPHONE MOUTHPIECES. Paul B. Bochicchio, Forest Hills, and Nicholas Yurack, Elmhurst, N. Y. Jan. 10, 1939.

Sanitary chemical held in compartment.

▼

2,143,966 TELEPHONE STATION. Edmund H. Yaeger, Longmont, Colo. Jan. 17, 1939.

Support for pay station so that it may be reached from automobile.

Twenty Millions for Cable Installation

In England, post office plans for the installation of new underground telephone cables during the next few months call for an expenditure of about £4,000,000 ($20,000,000). New cables will be laid between Newcastle and Carlisle; Salisbury, Bristol and Exeter; London and Hastings; Hull and Gainsborough, and Ipswich, Newmarket and Norwich.

SAFETY BULLETIN

Masochism is a term used in analytical psychology to denote a tendency to take pleasure in bearing pain inflicted upon oneself.

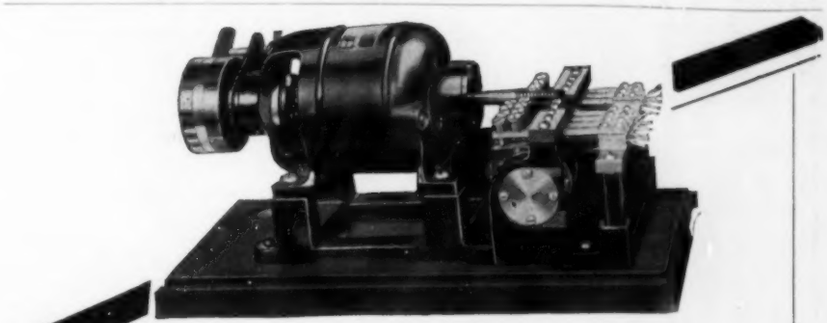
Masochism seems to be evinced by the fellow who frequently receives an avoidable injury and then complains about his hard luck.

Argentine Novelty

According to an American Consular report, the Argentina Post and Telegraph Department will make an experimental trial of a new type of service to telephone subscribers designated as "Fonopost."

It is a method by which voice recordings may be transmitted by mail. The sender will speak into a microphone installed in a public booth and have his voice recorded on an unbreakable record 20 centimeters in diameter. The record may then be mailed to any address. The total charge, including postage, will be one peso (23 cents) to any place in Argentina 1.25 pesos (29 cents) to the Americas and to Spain, and 1.50 pesos (35 cents) to other European countries.

Later it is planned to amplify the service by making it possible for a subscriber to do the recording from his own telephone connected to a central point, whence the record will be mailed to any address specified. The charges will be included in his regular telephone bill.



HOLTZER-CABOT
MOTOR-DRIVEN INTERRUPTER

Holtzer-Cabot complete motor driven interrupter equipment combines a method of producing good signaling tones with a means for automatic ringing. Holtzer-Cabot interrupter equipment will:

1. Eliminate slow acting relays.
2. Reduce maintenance.
3. Give positive timing.

AND

4. Is SIMPLE and DEPENDABLE.

Write for Bulletin 1310-02

THE HOLTZER-CABOT ELECTRIC CO.

125 Amory St. BOSTON, MASS. — *Motor Specialists* — 6161 So. State St. CHICAGO, ILL.

TELEPHONE MEN
ATTENTION

The application of a loud speaking telephone increases the value of present standard telephone systems.

Your customers expect you to recommend advanced communication equipment for their use and rely upon your good judgment to keep them informed of every development.

You cannot possibly afford to overlook the loud speaking telephone as one of the greatest advances in the communication art.

Our prices bring the most practical means of instantaneous communication within the reach of all.

A complete two-station set is available at

$39.95

The Master Unit shown above connects to a light socket for its source of power—no batteries need be used.

Wire connects the Master to the Remote Stations.

Additional Remote Stations at $12.50 each

Write today for information on how to obtain our

FREE DEMONSTRATORS

BANK'S

MANUFACTURING COMPANY

ORIGINATORS OF TWO-WAY LOUD SPEAKING TELEPHONES

5019 North Winthrop Avenue
CHICAGO

DUO-VOX and MULTIPHONE SYSTEMS

LICENSED UNDER BANK U. S. PATENT NUMBER 1,922,415

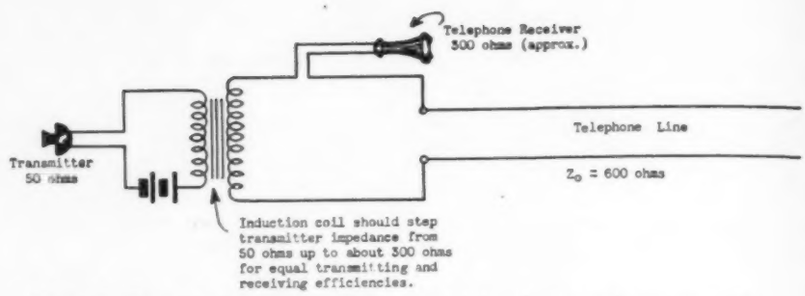

Telephone Receiver
300 ohms (approx.)
Telephone Line
Transmitter
50 ohms
Z_0 = 600 ohms
Induction coil should step transmitter impedance from 50 ohms up to about 300 ohms for equal transmitting and receiving efficiencies.

Figure 2—Use of L. B. Inductance Coil to match transformer and receiver to line.

Short Course in Telephone Transmission

(Continued from page 20)

inductance is not quite so understandable. Self inductance results from the magnetic field around each wire setting up a counter e.m.f. in the wire which acts the same as if an inductance was connected in series with the wire.

The impedance of a telephone line cannot be determined by a simple measurement of resistance, capacity and inductance at the input terminals of the line, as these constants are distributed uniformly over the line.

Mathematically the impedance of a telephone line can be computed by the following equation:

$$Z_0 = \sqrt[4]{\frac{r^2 + (6.28fl)^2}{g^2 + (6.28fc)^2}}$$

Where: Z_0—characteristic impedance in ohms
r—effective resistance in ohms per unit length
g—leakage resistance in mhos per unit length
l—inductance in henries per unit length
c—capacity in farads per unit length.

The unit length used in the above equation is the loop mile.

—TO BE CONTINUED—

Further Notes on New Volume Unit

(Continued from page 21)

pointer will reach 99 in 0.3 second and will overswing 100 by 1.0 to 1.5%. A certain amount of resistance must be in series with the meter as at present made, in order to obtain these characteristics.

4. Sensitivity—With the proper resistance in series with the meter, the normal deflection to 0 on the vu scale or 100 on the voltage scale is obtained with a volume level of +4 vu in a 600-ohm line. The same deflection is caused by a single frequency power of 4 db above one milliwatt.

Note: As indicated above, the 0 point on the vu scale is an arbitrary point at which the meter is normally read. A complete volume indicator includes a variable attenuator as well as the meter. In use this attenuator is normally adjusted until the swings of the meter needle just reach the 0 point on the vu scale, and the volume level is then read from the attenuator setting. The most sensitive attenuator step is marked "+4 vu". If the meter indicates some other value than 0, the volume level shown by the attenuator is corrected by the deviation from 0 shown on the meter.

5. Response vs. Frequency—The response is substantially uniform from 0 to 16,000 cycles.

6. Impedance—With the proper resistance in series with the meter, the input impedance is about 7,500 ohms.

7. Distortion—The instrument causes less than 0.2% harmonics to a 600-ohm line when bridged across it.

(Signed) D. K. GANNETT

A. M. Benedict Fatally Stricken

Suffering a stroke, A. M. Benedict, president-elect of the Missouri Telephone Association, and manager-owner of the Richards Telephone Company, died at his home in Richards, Mo., on May 8th. Interment was at Richards.

Japan Testing Multiparty Plan

According to a recent article in the Japan "Advertiser," multiparty line telephone service will be introduced on an experimental basis in the Ginza central office. This office serves one of the most important business districts in Tokyo. If the service proves satisfactory, it will be extensively introduced in other large urban centers throughout the country. Seventeen lines will serve one hundred subscribers on a multiparty basis, thus effecting a reported saving of about 80 per cent in wiring.

KLEIN "Lightweight" CLIMBERS

Klein "Lightweight" Climbers are built to the minimum weight possible consistent with maximum safety. Every pair is tested exactly the same as are the old time tried Standard Climbers. The lineman can throw his weight on these climbers with confidence —they are Klein's!

DISTRIBUTED THROUGH JOBBERS

Foreign Distributor: International Standard Electric Corp., New York

---

The four pamphlets listed below will be sent without charge to anyone interested. Check the ones you want:

- ☐ Lightweigh: Climbers.
- ☐ Specifications on Linemen's Belts and Safety Straps.
- ☐ Klein Kord Fabric Safety Straps.
- ☐ Pocket Tool Guide.

Mathias KLEIN & Sons
Established 1857 — Chicago, Ill. U.S.A.

3200 BELMONT AVENUE

"Tapping In" On Washington

(Continued from page 18)

which at all times during the preceding calendar year had less than five hundred stations."

For the telegraph industry, an amendment was included which gave the Wage-Hour Administrator discretionary power to freeze the minimum wages of messengers at 25 cents an hour or possibly the next level of 30 cents an hour so as to prevent any curtailment of employment.

THE telephone exemption amendment is inadequate and unsatisfactory from several viewpoints.

First, the language of the amendment which was evidently drafted on the recommendation of the Wage-Hour authorities does not average over the entire year the number of stations under which an exchange can secure exemption. The Independent telephone industry had sought the use of the averaging measure for the year's period because under the language of the present amendment an exchange which has 500 or 501 stations on one day of the year would fail to secure exemption. This would mean that seasonal fluctuations of stations would knock out exchanges from exemption even though for an entire year on an average they would be considerably below the 500-station level. The present amendment, it is felt, would tend to freeze the development of telephone usage because exchanges would be loath to secure temporary additions of stations which would eliminate them from the exemption level.

The telephone industry undoubtedly will seek an increase in the level of stations under which exchanges can secure the Wage-Hour exemption when the bill reaches the Senate.

There is some powerful support on the Senate side for the increasing of the number of stations, it is believed. Senator Herring, Democrat, of Iowa has sponsored a bill to exempt the operators of 1,000 subscriber exchanges and the idea of a substantial exemption to preserve the adequacy of rural telephone service is thought to have won favor with a number of Senators, including several members of the Senate Education and Labor Committee.

A recent addition to the Senate, Senator Slattery of Illinois, who succeeded the late noted Democrat J. Hamilton Lewis, is known to support the 1,000 subscriber level. Senator Slattery, while chairman of the Illinois Commerce Commission, had recommended the 1,000 subscriber figure to Wage-Hour Administrator Andrews and recently stated that he still favored that exemption measure.

(Next page please)

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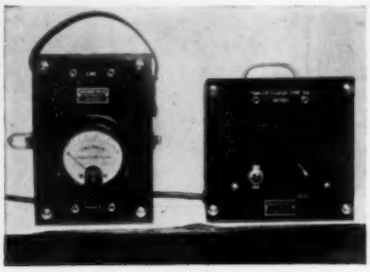

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No. 690NI

Completion of Telephone Investigation Report Now Likely in Early June

THE FCC was pretty much in the doldrums during the major part of May. Chairman Frank R. McNinch was away for the first portion of the month to recuperate from another attack of digestive troubles and as a result the month was spent mainly in "spade work" with very few important decisions being issued.

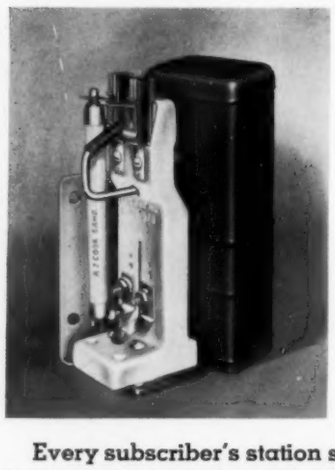
The most important task during the month has been the placing of the last touches of revision upon the Final Telephone Investigation Report to Congress which appears to be slated for possible transmission to Capitol Hill during early June. As a means of formulating the report in its final form, the FCC summoned back from California on a temporary 20-day appointment Carl I. Wheat, its former special Telephone Rate Counsel to take charge of the revision. Mr. Wheat arrived in Washington May 11 and immediately took over the task of the final revision—based on his 20-day appointment, the earliest chance for the Report being sent to Congress was deemed to be the first week in June. Mr. Wheat, it will be recalled, was the FCC rate counsel who negotiated with the American Telephone and Telegraph Co. the $12,000,000 interstate toll rate reduction that become effective Jan. 15, 1937. But, even though the Telephone Report goes up to Congress in early June, it seems rather definite that no action will be taken on its proposals at this session.

THE Wisconsin Telephone Company, according to the NLRB's decision can engage in collective bargaining with the Independent Union of Telephone Operators in the overwhelming majority of the exchanges—about 95—but has to bargain with the International Brotherhood of Electrical Workers in the four exchanges of Janesville, Kenosha, Racine and Superior. While the NLRB did not certify the Independent Union for the 95 exchanges, because that union had not asked for its certification, the Board did certify the IBEW. But it is interpreted that the Board gave approval to the Independent Union so that the company can continue its collective bargaining.

Member Edwin S. Smith in his dissenting opinion cited this recognition of the Independent Union by the other two members, Chairman Madden and Donald Wakefield Smith. The dissenting member held that the examiner's recommendation for the dissolution of the Independent Union should be approved and that all recognition by the NLRB should be withdrawn from that union. The dissenting opinion also contended that the previous plan of employee representation with its alleged company domination was carried over into the Independent Union. However, the majority opinion distinctly stated that the employee representation plan was completely abandoned and that the Independent Union was organized with full freedom of choice by the employees.

The Board's majority emphasized that it had found the Wisconsin Telephone Company had not dominated or interfered with the Independent Union and that the company had affirmatively proclaimed its neutrality so that all of its employees were free to join any union. The Board's opinion stated that the General Counsel of the American Federation of Labor had admitted the Wisconsin Telephone Company had not engaged in any unfair labor practices.

In certifying the four exchanges to come under the IBEW, the Board seemed to have departed from its declared policy (as expressed in its 1938 annual report) regarding labor organizations in communications and broadcasting companies. That policy cited the best method of labor organization in these industries was on a system basis. The Independent Union and the Wisconsin Telephone Company had contended before the NLRB that the proper representation for Wisconsin telephone employees was on a state-wide basis and that individual exchanges were not a satisfactory unit for collective bargaining.



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Every subscriber's station should be protected against the danger of lightning and hazards from light and power circuits.

Cook Type "O" provides such protection. It is equipped with True Gap Lightning Arresters and fuses. The lightning arresters ground excess voltages on the line and the fuses open when excessive current flows on the line.

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TERMINAL AND PROTECTION EQUIPMENT

COOK

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Negative Order Theory Overruled in Rochester Telephone Decision

While the Rochester, N. Y., Telephone Corporation lost its appeal before the U. S. Supreme Court on the FCC's ruling of its financial control by the New York Telephone Co., the highest tribunal's opinion in the case was highly significant for all telephone companies under Federal and State regulation, because Justice Felix Frankfurter in a clear-cut discussion held that the negative order theory should no longer be a controlling factor in future cases of governmental regulatory orders.

Justice Frankfurter stated that negative orders such as were claimed by the FCC in the Rochester case were reviewable and that distinctions between "negative" and "affirmative" orders by Commissions "as a touchstone of jurisdiction" for court reviews served no useful purpose and "can no longer be guiding." The Supreme Court held that the evidence showed the Rochester company was under the control of the New York Telephone Co. because of the one-third common stock and preferred stock ownership, particularly in view of the veto power of the latter securities.

REA Is Abolished and Functions Are Shifted to Agriculture Department

The termination of the Rural Electrification Administration as a separate agency and its transfer to the "roof of the Agriculture Department, as ordered in the second Presidential Reorganization plan which has just been approved by the Senate, may mean a change in the REA's policy regarding the compensation of rural telephone companies for inductive interference from electric light projects. The shift of REA to the Agriculture Department may be consummated by July 1, it is expected because the Senate is considering a resolution to make the reorganization plan effective in thirty days rather than the 60 day period.

As soon as the reorganization of the REA was announced by President Roosevelt, speculation arose that REA Administrator John M. Carmody might retire from the helm of that agency. Such a move by Carmody, however, could not be confirmed from his associates who inferred that he would not retire. But whether or not he leaves the REA it is believed that his policy of opposing compensation for inductive interference to telephone lines may be overruled by the Agriculture Department which realizes the value of telephone service to the farmers. The shift of REA would appear to present a hopeful sign for the Independent Telephone Industry in connection with the inductive interference.

(END)

Ben C. Schweitzer

Ben C. Schweitzer of Fort Wayne, Ind., became general manager of the Union Telephone Co., Owosso, Mich., and W. J. Melchers, president, and general manager was elevated to the office of chairman of the board, in a new set-up put into effect by the board of directors recently and which became effective April 24th.

Mr. Melchers is succeeded as president by V. E. Cheney of Kansas City, while Mr. Schweitzer takes over his duties as general manager.

The new general manager comes to Owosso with 20 years' experience in the telephone business. He was for four years a consulting engineer with the firm of J. G. Wray, consulting engineers of Chicago, and for the past 14 years has been commercial superintendent of the Home Telephone and Telegraph Co. of Indiana.

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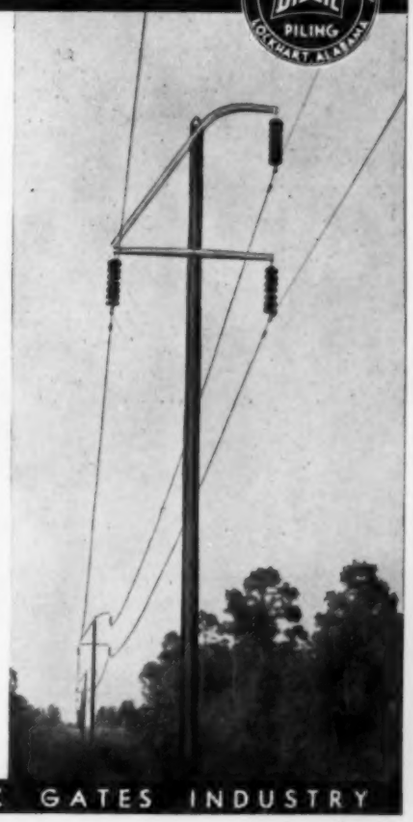

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PRESIDENT OF KELLOGG SWITCHBOARD & SUPPLY CO. DIES

GEORGE A. YANOCHOWSKI

George Albert Yanochowski, president of the Kellogg Switchboard and Supply Company, died May 14, 1939, at St. Lukes Hospital, Chicago, of coronary thrombosis. He had been in normal good health up until the morning of Tuesday, May 9th, when he developed a heart attack upon arriving at his office. He immediately returned home and was taken to the hospital the following morning.

Mr. Yanochowski was born on April 4, 1888, in Henry, Illinois. He received his preliminary education in the public and high schools, and later at the University of Illinois. He was also graduated from the Kent College of Law in 1919, receiving the degree of "Bachelor of Laws."

He studied electrical engineering and other technical subjects at the University of Illinois, and entered the telephone manufacturing business shortly after his graduation doing engineering and installation work. This experience qualified him for Patent Law work in this highly specialized field, and he served the Kellogg Company in that capacity for a number of years before being elected its Chief Executive in February 1930.

He was a young man at the time of his death, but with an unusual record of accomplishment in the technical, legal and executive fields. During his term as president of the Kellogg Company notable progress was made in technical fields and the status of the Company improved in many phases. The purchase of a factory site in the Clearing District and the construction of a modern building resulting in a permanent home for the Company was primarily his project. Mr. Yanochowski was universally liked and admired by all who were associated with him.

He was a member of the Patent Law Association, the Masonic Orders, a member of the Union League and Press Clubs of Chicago and the La Grange Country Club. He was also a director of The National Electrical Manufacturers Association and for nine years director of The U. S. Ind. Tel. Assn.

Mr. Yanochowski is survived by his wife, Helen, nee Winters, and by two daughters, Mrs. James C. Bowman and Helen Isabel.

He was a member of Emmanuel Episcopal Church, in La Grange, and interment was at Bronswood Cemetery, at Hinsdale.

Bell Station Gain For April

New stations added to the Bell System during April totaled 66,700, recording a gain much greater than that attained in the same month a year ago, but the rate of increase showed a slight slackening as compared to March when a total of 81,450 telephones were added. The April increase amounted to 36,800 more stations than the increase of April 1938, when 29,900 telephones were added.

The April gain was about in line with the average for January and February of this year and brought the cumulative figure for 1939 to 282,050 new telephones connected as compared to the same period of 1938 when only 127,900 stations were added. Excluding the first quarter of 1937, when 401,500 instruments were added, the year to date has made the best showing since 1930.

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Terminal room at the modernized San Angelo exchange. Equipped with new Stromberg-Carlson distributing frame and power and machine equipment.

Sonora, Texas Exchange Modernized

Cut-Over to Common Battery Service Effected Simultaneously With Opening of New Building

By T. C. THOMPSON
Stromberg-Carlson Sales Engineer

THE San Angelo Telephone Co., of San Angelo, Texas, operating one of the largest independent telephone companies in America, serves one-twelfth of the area of the largest state in the Union with 21 telephone exchanges. Latest step in the company's program of developing better service for west Texas was the complete renovation of its exchange at Sonora, prosperous center of Sutton County which is well known to Texans as "The Stockman's Paradise."

The Sonora modernization program included the replacement of the former frame office with a new, up-to-date exchange-residence building of brick. With occupation of the new one-story plant came a cut-over from the old magneto service to common battery with all its attendant advantages to subscribers.

At the heart of the improved service in a new Stromberg-Carlson two-position non-multiple switchboard serving 435 subscribers with 280 central energy lines, 50 toll and rural lines, and 30 universal cord circuits.

A NUMBER of features of the board which are bringing faster, more economical service to Sonora subscribers were cited by John Y. Rust, President of The San Angelo Telephone Co.

A uniform battery supply for operating local lines is maintained and dry batteries for local service are eliminated, doing away with the necessity of battery replacements on subscribers' premises. Local subscribers signal the operator by simply removing the receiver from its hook. They are never annoyed by rural subscribers' ring-off signals since non-ring-through circuits are used. The operator is provided with positive supervision on all connections, double lamp supervision promoting speed and accuracy. The compactness of lamp signals on local lines reduces the necessity of long reach by the operator.

New main distributing frame and power and machine equipment installed with the board are also of Stromberg-Carlson manufacture.

Sonora residents are prideful of the new exchange-residence building which is constructed of buff-colored face brick and building tile. Over the small entrance porch is an attractive canopy, with the lighted neon word "Telephone" on three sides. The lobby is eight by twenty-three feet, the office building width, and has two booths for patrons' use.

ADJOINING the lobby is a combined manager's office and operating room, slightly larger than the lobby. An equipment room 12 feet square houses a 24-volt battery, charging machine and ringing interrupter.

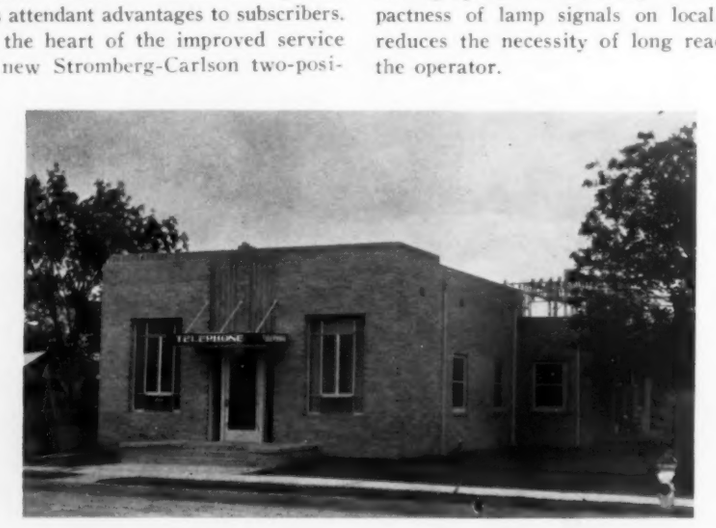
Adjoining the equipment room is a storeroom. A bedroom for operators and restroom with shower bath is also provided.

A back wing to the building provides living quarters for the manager's family consisting of living and dining rooms, two bedrooms, kitchen and bath. The residence portion, together with a double garage, face a shaded side street that runs at a right angle from the entrance.

The building was constructed with a view to providing a superior telephone system and engineering details to make it better were not overlooked. One example is a cable vault underneath the office which houses the cables that enter the building.

It was 37 years ago that the first Sonora Exchange was equipped to serve seven or eight subscribers on a toll line.

Many difficulties beset Mr. Rust and his managers in the early days when the



The home at Sonora (Texas) of the San Angelo Telephone Company. This is one of the company's 21 exchanges in West Texas system.

Picturing the new Stromberg - Carlson non-multiple switchboard cut into service at Sonora.

telephone industry was not the smooth working one it is today. Liquid batteries at each phone had to be recharged every five or six months. A drive to Sonora had to be made from San Angelo every once in a while to replace a 3-cent fuse or to make some other minor replacement or adjustment. Those old batteries gave away to dry cells in 1906 or 1907. Now they have been eliminated.

THE growth of the San Angelo Telephone Co. through the years since the early nineteen hundreds has been a steady, substantial one in Sonora, as it has in the huge West Texas area it serves. The principal business of the company is in San Angelo and is linked closely with the exchanges in twenty other communities of the San Angelo territory.

Manager of the Sonora plant is W. R. Barnes who has been in charge of the San Angelo Telephone Company's business in Sonora since 1920.

C. S. Powell Receives Appointment as Assistant Telephone Sales Manager of Graybar Electric Company

Effective February 1st, C. S. Powell, Manager of the Louisville Branch since it was established in 1929, will be at the General Department as Assistant Telephone Sales Manager.

In 1914, immediately after he was graduated from Case School of Applied Science, Mr. Powell started in the Student Course at Hawthorne. He became Assistant to the Telephone Specialist at Omaha in 1915. In 1916 he was appointed Telephone and Farm Lighting Specialist at Omaha. From 1917 to 1919 he was in the Air Service. On his return in 1919 he became Telephone and Farm Lighting Specialist at St. Louis,

C. S. Powell, newly selected Assistant Telephone Sales Manager of the Graybar Electric Co.

and later Appliance and Radio Specialist. In 1923 he was made Sales Manager at Nashville and in 1926 Manager. In 1929 he was transferred to Louisville as Manager of that new house.

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The Southwestern Springfield (Mich.) Telephone Co., with seven subscribers and about five miles of line, is closing its business.

Recently the subscribers, all stockholders in the company, met with Mr. and Mrs. Fred Shafer, and Shafer, treasurer of the company, distributed the $20.95 remaining in the treasury. Now poles are being cut down for firewood. The Michigan Bell Telephone Co. is providing telephone service for the subscribers.

The tiny company was organized about 30 years ago when the Michigan Bell Telephone Co. ran its service through the northern half of Springfield Township in Oakland County but refused to service the southwestern section because of lack of subscribers.

The company owned one pair of spurs, and maintenance costs were small, as each subscriber served as his own lineman.

"We could all run up poles like squirrels," Shafer asserts.

However, most farmers used ladders in making repairs.

Obituaries

Percy A. Megahee, 45, assistant division attorney with the Atlanta office of the American Telephone & Telegraph Company, died February 26, after an illness of 3 months.

Archibald Rowling Maclean, for 29 years an engineer in the plant department of the Illinois Bell, died March 14, at his home at 1521 Sherwin Ave., Chicago.

E. J. Howells, 61, a veteran executive of the Illinois Bell, and highly respected citizen of Peoria, Ill., died suddenly from heart disease at his office in that city, on April 4th.

Charles Rosser Brooks, Chicago, after twenty-nine years of service in the engineering department of telephone companies, died at his home in Chicago, April 12.

Fred Coulson, 60, at one time general manager of the United Telephone Co., Abilene, Kansas, died suddenly the morning of March 29 at his home in that city. His association with the United company dated back to 1915. For many years a vice-president of the Kansas Independent Telephone Association, he also served as vice-president of the Independent Pioneer Telephone Association. At various times during his career in the telephone business which started in 1897, he was connected with the Missouri & Kansas Telephone Co., the Dean Electric Company, Kansas City Home Telephone Co., and in 1915 he started his long career with the United company which ended in 1936 when he resigned as general manager.

Motor Changeover Unit

Recently announced is a hot cathode full wave mercury vapour rectifier of extremely high efficiency. It was designed especially for motor changeover work or for any place where 12 amps. full wave pulsating D. C. at about 110 volts rms. is satisfactory.

A small transformer is used for heating the cathodes and it supplies 104 watts for this purpose regardless of load. The voltage drop in the arc of each tube is only 5 to 8 volts, so that the efficiency of the unit supplying 110 volts D. C. is about 80% and when used to supply 220 volts D.C., it is about 90%.

The efficiency of this unit is very apt to be underrated practically, if the usual voltmeters and ammeters are used to make measurements because almost all A.C. voltmeters measure effective (rms) values while almost all D.C. voltmeters measure average values, so that if the rectifier were 100% efficient the voltmeters would still indicate only 90% efficiency.

$$\frac{E\ av.}{E\ ef.} = \frac{.636\ \ E\ m}{.707\ \ E\ m} = .90$$

Therefore instruments which have the same type of movements should be used to measure the input and the output. A wattmeter would of course measure the effective value on either A.C. or D.C.

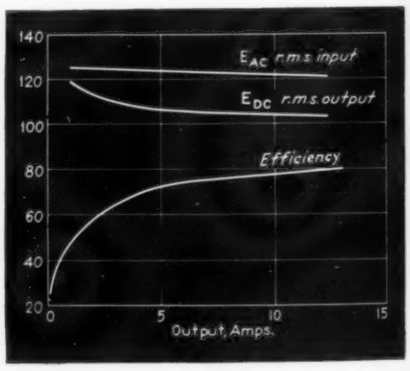

Figure 1

Fig. 1 is a curve showing the actual results with this rectifier on 125 volts alternating current driving a 2 h.p. D.C. motor. The entire unit weighs but 20 pounds.

This device was invented, developed and designed by Harold J. McCreary, who is also the sole distributor. The unit is manufactured in Chicago. Installations have been in operation since last fall.

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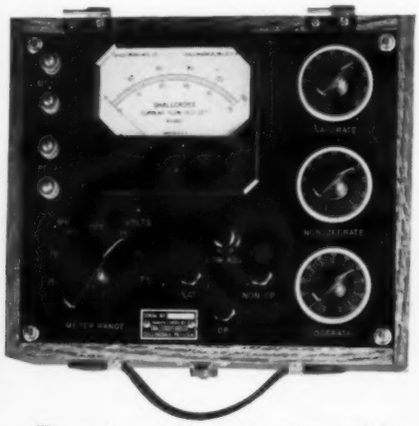
Plant Improvements In Illinois

Extensive improvements are being made in the offices of the Pike Telephone Company at Pittsfield, Ill. Switchboard is being moved. New dial systems are being installed at Rockport and Kampsville. At Mt. Carroll, the Northwestern Illinois Utilities have installed a large amount of cable, moved its central office and installed a new two-position switchboard. At Reynolds, the Reynolds Independent Telephone Association has also installed a new switchboard.

Shallcross No. 695 Current Flow Test Set for Relay Adjustment

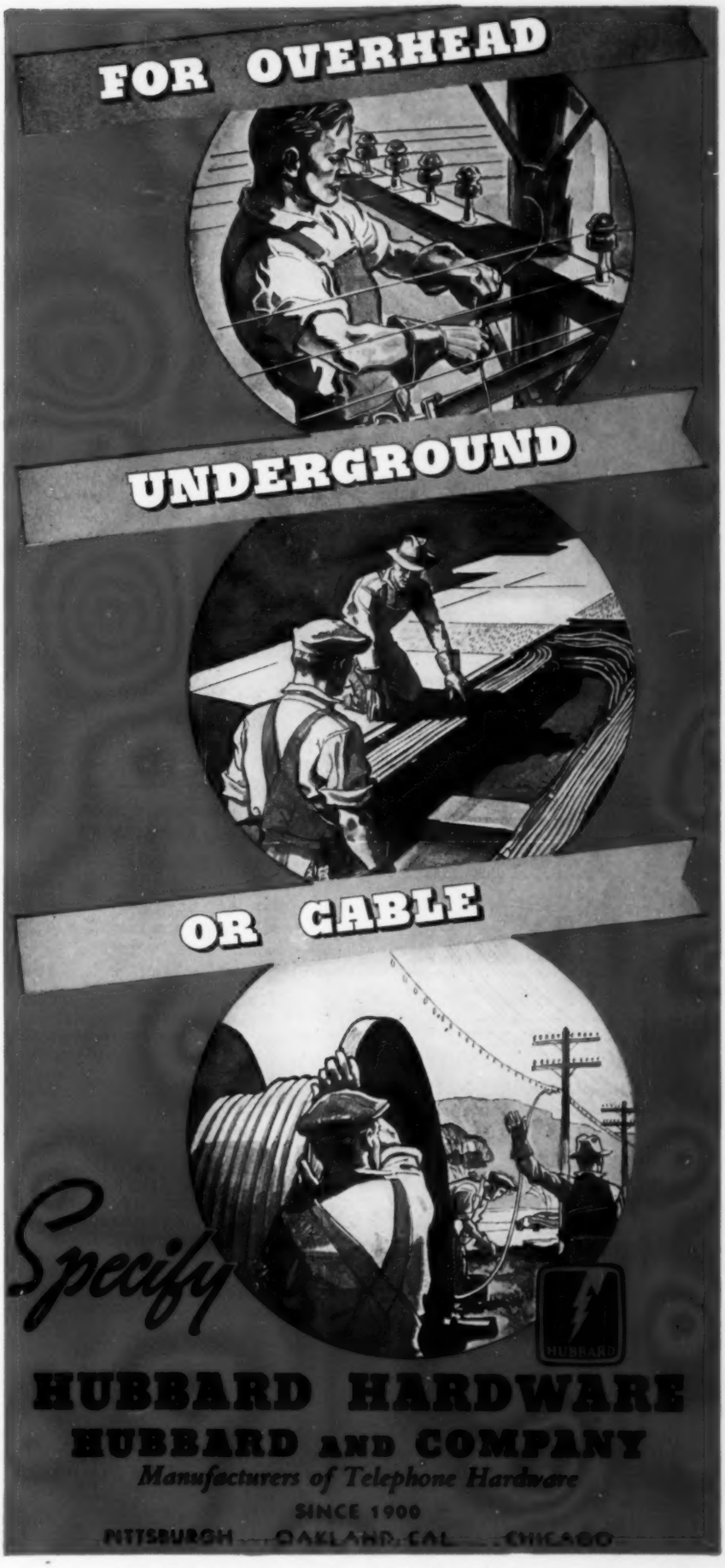
The purpose of this current flow test set is to adjust and margin relays on the current flow basis. This instrument may be conveniently used to regulate and measure accurately the current flowing through the winding of a relay in order that it may be adjusted properly to provide its "Operate" "Non-operate" or "Release" features.

The component parts of the test set consists of a milliameter, controlled by a "Meter Range" switch, equipped with suitable shunts to provide full scale ranges of 15-75-150 Milliamps, also the necessary multiplier resistors to provide full scale voltage ranges of 7.5 and 75 volts.



The meter of this set is connected for relay testing, however, two external binding posts are provided which permit the use of the meter for any other purpose for which it is designed. This multi-range D. C. voltmeter and milliameter will be found convenient for making numerous special tests in the telephone exchange.

This test set is easy to use and relays adjusted with it will function properly without attention for long periods of time. When all relays on a switchboard are properly adjusted by the current flow method, the troubles on the system will be reduced to an



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Patent Studies	Telephony

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FOR SALE: 120 Western Electric No. 22C Combined Drops and Jacks, five per strip. Good condition. New thimbles, refinished mounting plates. $4.00 per strip. Also Paragon Battery boxes @ 25c. Manawa Telephone Co., Manawa, Wis.

absolute minimum. Later a recheck at regular intervals will insure their continued proper operation with little attention or trouble. Address the Editor for additional information. No charge for this.

New Electric Tool Announced

By eliminating the bulky motor-in-hand tool the Foredom Electric Company, 27-T Park Place, New York, has announced an electric tool that grinds, polishes, drills, removes rust and corrosion, sharpens, slots saws, mills, sands, carves, and many other purposes.

It consists of a Universal motor with pencil sized lengthy handpiece that enables it to be used in the plant at hard to get to places. Quick interchange of accessories is available with a 50 piece accessory set at the cost of $1.00. The company enjoys the reputation of making fine precision instruments. The entire tool sells for $15.50.

Chance Company Transfers Jack Curtright to West

Announcement has just been made by the A. B. Chance Company of Centralia, Mo., that Jack Curtright who has represented them in the central states has been transferred to a western territory to cover states west of the Rockies. He will represent the company in the sale of anchors, guy fixtures and Tips Tools. Curtright came from a division of General Motors Corp. but had previously been assistant sales manager of the Chance Co.

WANTED: Experienced interior wire man, Chicagoan preferred. Good opportunity for man who knows interior telephone wiring. Box 8234. TELEPHONE ENGINEER.

FOR SALE: Independent telephone company, local and long distance, of 500 odd stations, situated in valley principally agricultural with growing rural manufacturing. Plant and system in excellent condition. Minimum of maintenance necessary. Box 801-S TELEPHONE ENGINEER.

Telephone Directories

Telephone Directory
ADVERTISING
Write or telephone for proposition
L. M. BERRY & CO.
Call L D 16 Telephone Bldg. Dayton O.

Poles

Carney
CEDAR POLES
Plain or Butt Treated
B. J. CARNEY & CO.
100 No. 7th St. Minneapolis

Finished Cedar Poles
VALENTINE CLARK CORPORATION
St. Paul, Minn.

CLASSIFIED

POSITION WANTED: As combination man or lineman with independent company, by young man of good character, single, with no encumbrance, 8 years experience with magneto and central battery systems with Bell Company; also have line construction experience, can furnish good reference, not afraid of work, available immediately, location immaterial. Box 8233. TELEPHONE ENGINEER.

POSITION WANTED — High School graduate, I.C.S. graduate in Practical Telephone Work, age 22, single. Has good theoretical knowledge of telephone business but no practical experience. Wants to learn telephone business from ground up. Will consider any position in plant department of any fairly large company. Box 8232 TELEPHONE ENGINEER.

The Clearing House

For the convenience of readers of Telephone Engineer

RECONDITIONED KELLOGG C. B. DESK SETS

No. 118 DESK STANDS

F-602 ENCLOSED GONG BELL BOXES

Straight line and harmonic.

◆

Write for prices.

◆

Buckeye Telephone & Supply Company

COLUMBUS, OHIO

RECONSTRUCTED EQUIPMENT

Kellogg No. 115 Grabaphones complete with 3 Cond. Cord less signal set @	$ 4.50
Kellogg No. 115 Grabaphone with 3-bar 1000-1600 or 2500 ohm ringer inside connection signal set @ $10.00 — 4-bar $10.50 — 5-bar	11.50
Stromberg Carlson No. 1177 Bakelite Hand set complete with 3 Cond. Cord less signal set @	8.75
Stromberg Carlson No. 1177 hand set with 3-bar 1000-1600 or 2500 ohm ringer inside connection signal set @ $14.25 — 4-bar $14.50 — 5-bar @	15.25
Western lec. No. 46 Central Battery Ind. Coils 50c ea. No. 20 @	.35
Kellogg No. 53 2 M. F. Condensers @	.35
Leich or Monarch Local Battery Transmitters complete with back @	.90
Kellogg No. 2809 4-bar 1000-1600 or 2500 ohm ringer short type compacts @	9.25
Western Elec. No. 315 3-bar 1000-1600 ohm 2500 ohm ringer inside connection signal sets with new cabinets @	5.50
New cabinet inside connection signal sets with well known mfg. 4-bar 1000-1600 or 2500 ohm ringers $5.75 — 5-bar @	6.50
Kellogg No. 729 S. A. Straight line oak finish wood hotel sets with Booster Ind. Coil @	6.75
Kellogg No. 831 Central Batt. steel hotel sets with Straight line or 16-33-50 or 66 cycle ringers and Booster Coil @	7.00
Double pole double throw 15 Amp Knife switches @	.25
Kellogg No. 41 slip type receivers with new shell and cord @	1.25
Kellogg or Western Elec. Insulated Type Transmitters complete with back @	1.10

WRITE FOR BULLETIN

REBUILT ELECTRIC EQUIPMENT CO.

1934 WEST 21ST ST., PILSEN STATION

CHICAGO, ILL.

Oliver Announces Personnel Changes

Harry F. Devens, chairman of the Board and John Jenkins, Vice President and Secretary, Oliver Iron and Steel Corporation, Pittsburgh, Pa., have retired from active service. Mr. Jenkins has been associated with the company for over fifty-two years, and he retains his directorship.

New officers elected are as follows: Theodore F. Smith, President; H. O. Rea and J. C. Rea, Vice Presidents; L. E. Uhrich, Secretary and Controller; W. F. Roll, Treasurer; J. P. Roche, Assistant Secretary; J. H. Lammert, Assistant Treasurer.

CLASSIFIED

FOR SALE: 200 Kellogg and Western Electric steel hotel type common battery wall telephones, enclosed and exposed gong types. Also, Kellogg and Western Electric 5-bar 1600 ohm wall telephones. Bargain prices. Inter-Mountain Telephone Company, Bristol, Tenn.

B. E. E., U. of Minnesota 1930, 32, single, 6 years experience in engineering department of large telephone manufacturer, familiar with dial and manual telephone central office equipment. Prefer position with telephone company or telephone manufacturer. Any position in electrical field considered. Available immediately. Location immaterial. Box 8230 TELEPHONE ENGINEER.

WILL BUY TELEPHONE EXCHANGE in Middle or Western State from 200 to 500 stations. Want a small exchange, but not too small. Will want to own and manage exchange myself. Answer W. H. M. c/o TELEPHONE ENGINEER.

"WANTED—Young man thoroughly capable of complete maintenance of Strowger dial automatic equipment. Experience in equipment installation desirable. Letter of application should include full details of experience and qualifications." Box 8229 TELEPHONE ENGINEER.

Specialists in Rebuilding and Repairing

TRANSMITTERS

Western Electric grounded transmitters rebuilt and made metallic, @ ..... $ .80

Metallic type of transmitters complete rebuilt, each ..... .50

Automatic Electric off-center Common Battery desk stands, arranged for, but not equipped with dials, 3 conductor cord, rebuilt in A-1 manner, @ ..... $ 4.50

The same, together with enclosed gong steel ringer box, straight line ringer, booster circuit for the set 9.00

We will trade Rebuilt Common Battery Equipment for Magneto Telephone Parts

REBUILT WALL OR DESK PHONES FROM YOUR OLD PARTS

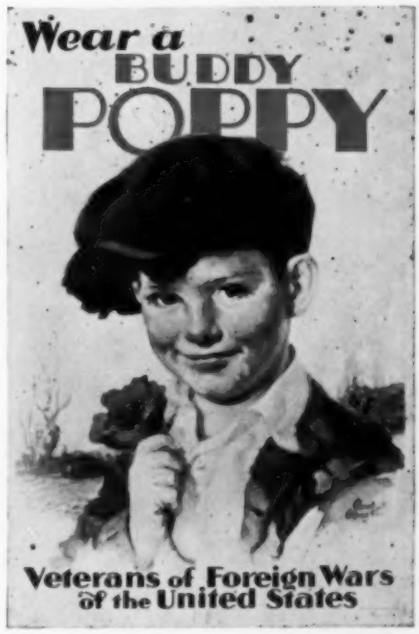
Send us the parts from your old Wall Phones and we will return to you a complete Wall or Desk Phone rebuilt like new with new oak cabinet. Price (F.O.B. Chicago) ..... $ 7.50

Reliable 16 pair protected A-27 terminal complete with saw-tooth discharge blocks, 5 amp. fuses, NO STUBS ..... $ 7.00

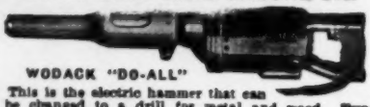
Reliable 16 pair protected A-27 terminal complete with saw-tooth discharge blocks, 5 amp. fuses and new 6 foot stubs 11.00

TELEPHONE REPAIR CO.

Rogers Park Station, Chicago, Illinois



DRILLS HOLES IN CONCRETE
FOR EXPANSION BOLTS, CONDUITS, ETC.



WODACK "DO-ALL"
This is the electric hammer that can be changed to a drill for metal and wood. Two sizes. Ask for prices.
Wodack Elec. Tool Corp. 4637 W. Huron St. CHICAGO, ILL.

IMPROVED
RARE GAS ARRESTERS

Avoid interruptions to service and provide full protection. Keep your lines clear and reduce maintenance expense. Interchangeable with other types.

New Vincent
RARE GAS
RELAYS

On rural party lines cuts out inductive interference, improves transmission; used with either coded or harmonic bells. EASY to install.

TEST-O-LITE

Handiest electrical tester made; Neon light quickly tells where trouble lies in electric circuits, fuses, cut-out's, motors, radios, appliances, etc. 1,001 uses for electricians. Tests any voltage 110 to 550; tells A.C. from D.C. Fountain-pen size; with pocket clip. Lifetime guarantee.

L. S. BRACH Mfg. Corp.
NEWARK, N. J. - Estab. 1906
Oldest Makers of Rare Gas Devices

"UNIQUE"
No. 3 BLOW TORCH
—For Cold Windy Weather!

Flame 1x7" - 2000° F.
Long Life Generator
Automatic Cleaning Needle
Cool Bakelite Wheel
Removable Channel Plugs
Welded Steel Tank
Hundreds of Hours Efficient Service
Net $6.80
and worth it!

Folding SAFETY Shield
Protects Splicer, Public & Furnace
Folds Flat for Carrying

No. 50
as shown
Net $10.50

No. 50A
4 sided
no grate
Net $7.50

No. 50C
3 sided
no grate
Net $3.94

No. 50

Unique Mfg. Co., Inc.
221 W. Walton St.
CHICAGO, ILL.

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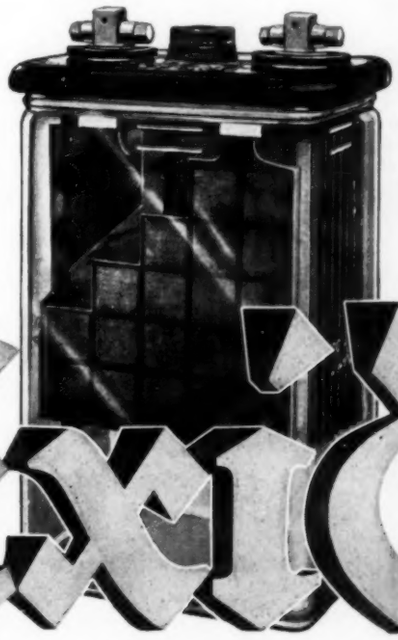
IF HIS UNCLE HANK WAS ALIVE, HE'D DISINHERIT HIM
CAN'T SEE WHAT HE SEES IN HER
AW MUSH!
YES, DEAR
OH BOY! A PIPPIN'
HUMPH! SO THAT'S A CO-ED
I WANTA SEE HER TOO

The Television Telephone Down On The Farm

Recently a patent was issued for a television telephone. We remembered that music, gossip, news and many other forms of entertainment were regularly broadcast among groups of people on rural party lines many, many years before radio broadcasting was even thought of. So we had our artist install a television telephone on a modern rural party line just to see what might happen.

Of course, the use of such an invention may never be as we have illustrated it. But, regardless of what does happen actually, and regardless of what new services and devices are developed by telephone engineers for future use, these engineers will be always able to rely upon Exide Batteries to do their share in maintaining the quality, speed and continuity of service which the public expects.



Today, in many thousand telephone exchanges Exide - Chloride Batteries not only provide a tremendous reservoir of power for emergency use, but when everything is going smoothly they contribute their share of the work necessary to maintain your standards of performance. Their operation is not interfered with by interruptions or fluctuations of the a.c. power.

No matter what your telephone battery job may be—common battery, emergency reserve, signalling, P.B.X.—it will be done more dependably and economically by an Exide-Chloride Battery.

Exide

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

The World's Largest Manufacturers of Storage Batteries for Every Purpose

Exide Batteries of Canada, Limited, Toronto